Transcript Exhibit(s)

Docket #(s): T-00000A-00-0194

Exhibit # : S1-S3, Qwest1; Qwest3 - Qwest5, ATT/MCI1 - ATT/MCI4, MTI1, MTI2

BEFORE THE

ARIZONA CORPORATION COMMISSION

IN THE MATTER OF THE GENERIC INVESTIGATION INTO U S WEST COMMUNICATIONS, INC.'S NKA QWEST CORPORATION, COMPLIANCE WITH CERTAIN WHOLESALE PRICING REQUIREMENTS FOR UNBUNDLED NETWORK ELEMENTS AND RESALE DISCOUNTS	)	DOCKET NO. T-00000A-00-0194

DIRECT TESTIMONY AND SCHEDULES

OF

WILLIAM DUNKEL

ON BEHALF OF

THE STAFF OF THE ARIZONA CORPORATION COMMISSION

APRIL 28, 2003

I. STATEMENT OF QUALIFICATIONS AND INTRODUCTION

Q. PLEASE STATE YOUR NAME AND YOUR BUSINESS ADDRESS.

A. My name is William Dunkel. My business address is 8625 Farmington Cemetery Road, Pleasant Plains, Illinois 62677.

Q. WHAT IS YOUR PRESENT OCCUPATION?

A. I am a consultant providing services in telephone rate proceedings. I am the principal of William Dunkel and Associates, which was established in 1980. Since that time, I have regularly provided consulting services in telephone regulatory proceedings throughout the country. I have participated in over 140 state regulatory proceedings before over one-half of the state commissions in the United States, as shown on Appendix A attached hereto. I have participated in telephone regulatory proceedings for over 20 years.

I currently provide, or in the past have provided, services in telecommunications proceedings to the following clients:

The Public Utility Commission or the Staffs in the States of:

Arkansas	Missouri
Arizona	New Mexico
Delaware	U.S. Virgin Islands
Georgia	Utah
Guam	Virginia
Illinois	Washington
Maryland	Kansas
Mississippi	

The Office of the Public Advocate, or its equivalent, in the States of:

Colorado	Missouri
District of Columbia	New Jersey
Georgia	New Mexico
Hawaii	Ohio
Illinois	Oklahoma
Indiana	Pennsylvania
Iowa	Utah
Maine	Washington
Florida	

The Department of Administration in the States of:

Illinois	South Dakota
Minnesota	Wisconsin

Q. ON WHOSE BEHALF ARE YOU TESTIFYING?

A. I am testifying on behalf of the Staff of the Arizona Corporation Commission (ACC).

Q. HAVE YOU PREVIOUSLY PARTICIPATED IN ANY PROCEEDINGS IN ARIZONA?

A. Yes. Most recently, I filed testimony on behalf of the ACC Staff in Phase IIa of this proceeding, Docket No. T-00000A-00-0194. In addition, I filed testimony on behalf of the ACC Staff in Phase II of this proceeding. I also filed testimony on behalf of the ACC Staff in the general rate case, Docket No. T-01051B-99-0105. I also filed rebuttal testimony in Docket No. T-01051B-97-0689 on behalf of the ACC Staff regarding depreciation. In addition, I conducted a Cost of Service Study on behalf of the Staff of the Arizona Corporation Commission in an undocketed matter preparing a cost study pertaining to Qwest Corporation (formerly US West Communications (USWC)). I was a rate design witness in general rate case, Docket No. E-1051-93-183, involving USWC on behalf of the ACC Staff.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of this testimony is to address the issues set forth in the Commission's April 11, 2003 Procedural Order in this proceeding.

Q. WHAT IS THE FIRST ISSUE PRESENTED IN THE PROCEDURAL ORDER?

A. The first issue is:

> Should Staff's Opinion 1 (the transport rates prior to this Cost Docket) or Staff's Option 2 (the transport rates adopted in Decision No. 64922 minus the entrance facility charges where no entrance facility is provided) be adopted as the rates for DS1 and DS3 transport effective until the reconsideration of these rates in Phase III of the Cost Docket?

Q. WHAT IS YOUR POSITION ON ISSUE 1?

A. Since I was involved in authoring both of these options, I believe either one of them would be a reasonable interim solution. Of the two, I prefer Staff Option 1, which is to return to the transport rates that were in effect prior to Phase II. Those prior rates had previously been approved by the Commission. However, since I also presented Option 2 as an acceptable interim solution, I do not have a strong objection to Option 2 being the interim solution.

Q. WHAT IS THE SECOND ISSUE SET FORTH IN THE ORDER?

A. The second issue is:

> Are the revised rates that are determined as a result of the expedited hearing effective as of June 12, 2002 or from the effective date of the Order adopting the revised rates?

Q. WHAT IS YOUR POSITION ON ISSUE 2?

A. The issue of retroactive rates is a legal issue, which I will not address.

However, as a result a recent discovery, we have determined that the application and costs of the transport rates are different than what was incorporated into the Phase II rates.

Prior to Phase II, Qwest charged a separate "entrance facility" rate and separate "transport" charges. In Phase II, these two rates were replaced with one "transport" charge. The cost studies and the rates assumed there was one entrance facility for each transport rate. Therefore, the transport rates that were approved effectively included the cost of one entrance facility.

In the cost studies and rates that were accepted in that proceeding, the cost and rates for "entrance facilities" were zero, because those costs, and the rates to recover those costs, were included in the new "transport" charges.

The impacts of the new rates should have been fairly minor. For example, a 15 mile DS1 circuit plus entrance facility had "before" rates that totaled $139.51 ($89.42 for the entrance facility plus a $35.99 fixed transport charge, plus $0.94 per mile for transport). After Phase II, the transport rate was $148.97. This would have been an increase of about 7 percent.

However when the Phase II rates went into effect, Mountain Telecommunications, Inc. (MTI) provided information that the actual effects of these rates were huge percentage increases, much greater than 7 percent. The staff conducted discovery of MTI and Qwest to determine why the actual impact of the price change was much greater than the impact that was expected. Both the Qwest and MTI responses show that many of those circuits are arranged in ways that do not include an entrance facility.[1]

I have reviewed those responses and determined that MTI's transport lines are provided in such a way that they were not previously paying entrance facilities charges. The rate impact on such lines was large. In the 15 mile DS1 example previously discussed, the rate would go from $50.09 ($35.99 fixed transport charge, plus $0.94 per mile for transport) to $148.97, a 200% increase.

By paying the current transport charges, MTI is effectively paying for entrance facilities that they are not using. This is an overcharge to MTI and to similar companies.

Q. WHAT IS THE THIRD ISSUE IN THE ORDER?

A. The third issue is:

> What is the appropriate analog port rate using the HAI model as adopted by the Commission? Included in this issue is the appropriate allocation of switching costs between the port rate and usage rates. The parties agree that reciprocal compensation rates will not be addressed in the expedited hearing.

[1] MTI response to Staff 1-1 and 1-2 and Qwest response to Staff Request 23.

Q. WHAT IS YOUR POSITION ON ISSUE 3?

A. I agree that the total cost of the switch (as determined by the HAI run) should be recovered in the sum of the port and traffic sensitive rates. Qwest's Compliance Filing dated January 10, 2003 shows two different proposed "port" rates. Qwest proposes a port rate of $2.44 and AT&T in that Compliance Filing supported the port rate from the Order of $1.61, which was Staff's proposal.[2] This problem arises primarily out of an inconsistency in the Order. The Order specifies the port rate should be $1.61.[3] Another portion of the Order specifies that 60% [4] of the switching costs should be considered port (and therefore 40% should be considered traffic sensitive).

The problem is that the $1.61 port rate was not based upon 60% of the switching costs being allocated to the port (The $1.61 was based on 30% of the switching being port costs). If both the $1.61 port rate, and traffic sensitive rates (that are based on 40% of the switch costs as usage)continue to be used, then 100% of the switch costs would not be recovered. This is not a desirable result.

The switching equipment contains traffic sensitive equipment, and also contains non-traffic sensitive equipment (which is termed the "port"). The non-traffic sensitive equipment (port) includes a "line card". The line card is connected to the loop facilities. The number of line cards required depends on the number of loops, not the level of traffic. Therefore, this cost is considered non-traffic sensitive.

[2] Earlier in these proceedings AT&T had proposed a port rate of $1.10
[3] Arizona Phase IIA Opinion and Order pg.16
[4] Arizona Phase IIA Opinion and Order pg. 17

On the other hand, inside the switch there is what is called the switching network (sometimes called the "switching fabric"). This is the equipment that switches calls. This cost is for switching traffic, and is therefore properly considered to be a traffic sensitive cost.

The exact distribution between the traffic sensitive and non-traffic sensitive costs may vary by switch manufacturer, or by other factors. The number of lines served by the switch could also impact the percent that is traffic sensitive versus non-traffic sensitive. However, for all local switches, a part of the costs is traffic sensitive and part is non-traffic sensitive.

If the Commission once again adopts the $1.61 port rate originally proposed by Staff, then it will be necessary to change the allocation of costs between port and traffic sensitive rates contained in the Order, and increase the usage rates above the levels set in the Order

Alternatively, if the Commission decides to keep the allocation of 60% to port and 40% to traffic sensitive contained in the Order, the existing port rate would have to change to $2.44. Using the 30 percent port and 70 percent traffic sensitive distribution initially proposed by AT&T, the port rate would be $1.10. Staff originally proposed that the existing $1.61 port rate be maintained because it appeared to be a reasonable compromise between what Qwest and the CLECs ($1.10) were proposing at the time. However, since

I have not conducted a study to determine what the correct mix is for the switching equipment in Arizonia, I will review the evidence presented by the parties on this issue.

My recommendation at this time is that the sum of the port and usage rates must recover 100% of the switching costs (as determined by the HAI). This means that either the port rate would have to be higher, or the usage rates would have to be higher, than the rates set in the Order.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes.

APPENDIX A

William Dunkel, Consultant
8625 Farmington Cemetery Road
Pleasant Plains, Illinois 62677

Qualifications

The Consultant is a consulting engineer specializing in telecommunication regulatory proceedings. He has participated in over 140 state regulatory proceedings as listed on the attached Relevant Work Experience.

The Consultant has provided cost analysis, rate design, jurisdictional separations, depreciation, expert testimony and other related services to state agencies throughout the country in numerous telecommunication state proceedings. The Consultant has also provided depreciation testimony to state agencies throughout the country in several electric utility proceedings.

The Consultant made a presentation pertaining to Video Dial Tone at the NASUCA 1993 Mid-Year Meeting held in St. Louis.

In addition, the Consultant also made a presentation to the NARUC Subcommittee on Economics and Finance at the NARUC Summer Meetings held in July, 1992. That presentation was entitled "The Reason the Industry Wants to Eliminate Cost Based Regulation--Telecommunications is a Declining Cost Industry."

The Consultant provides services almost exclusively to public agencies, including the Public Utilities Commission, the Public Counsel, or the State Department of Administration in various states.

William Dunkel currently provides, or in the past has provided, services in telecommunications proceedings to the following clients:

The Public Utility Commission or the Staffs in the States of:

Arkansas	Mississippi
Arizona	Missouri
Delaware	New Mexico
Georgia	Utah
Guam	Virginia
Illinois	Washington
Maryland	U.S. Virgin Islands

The Office of the Public Advocate, or its equivalent, in the States of:

Colorado	Maryland
District of Columbia	Missouri
Georgia	New Jersey
Hawaii	New Mexico
Illinois	Ohio
Indiana	Pennsylvania
Iowa	Utah
Maine	Washington

The Department of Administration in the States of:

Illinois	South Dakota
Minnesota	Wisconsin

In April, 1974, the Consultant was employed by the Illinois Commerce Commission in the Electric Section as a Utility Engineer. In November of 1975, he transferred to the Telephone Section of the Illinois Commerce Commission and from that time until July, 1980, he participated in essentially all telephone rate cases and other telephone rate matters that were set for hearing in the State of Illinois. During that period, he testified as an expert witness in numerous rate design cases and tariff filings in the areas of rate design, cost studies and separations. During the period 1975-1980, he was the Separations and Settlements expert for the Staff of the Illinois Commerce Commission.

From July, 1977 until July, 1980, he was a Staff member of the FCC-State Joint Board on Separations, concerning the "Impact of Customer Provision of Terminal Equipment on Jurisdictional Separations" in FCC Docket No. 20981 on behalf of the Illinois Commerce Commission. The FCC-State Joint Board is the national board which specifies the rules for separations in the telephone industry.

The Consultant has taken the AT&T separations school which is normally provided to the AT&T personnel.

The Consultant has taken the General Telephone separations school which is normally provided for training of the General Telephone Company personnel in separations.

Since July, 1980 he has been regularly employed as an independent consultant in telephone rate proceedings across the nation.

He has testified before the Illinois House of Representatives Subcommittee on Communications, as well as participating in numerous other schools and conferences pertaining to the utility industry.

Prior to employment at the Illinois Commerce Commission, the Consultant was a design engineer for Sangamo Electric Company designing electric watt-hour meters used in the electric utility industry. The Consultant was granted patent No. 3822400 for a solid state meter pulse initiator.

The Consultant graduated from the University of Illinois in February, 1970 with a Bachelor's of Science Degree in Engineering Physics with emphasis on economics and other business-related subjects. The Consultant has taken several post-graduate courses since graduation.

APPENDIX A

RELEVANT WORK EXPERIENCE OF WILLIAM DUNKEL

ARIZONA	
- U.S. West Communications	Cost of Service Study
Wholesale cost/UNE case	Docket No. T-00000A-00-0194
General rate case	Docket No. E-1051-93-183
Depreciation case	Docket No. T-01051B-97-0689
General rate case	Docket No. T-01051B-99-0105
ARKANSAS	
- Southwestern Bell Telephone Company	Docket No. 83-045-U
CALIFORNIA	
(on behalf of the Office of Ratepayer Advocates (ORA))	
- Kerman Telephone General Rate Case	A.02-01-004
(on behalf of the California Cable Television Association)	
- General Telephone of California	I.87-11-033
- Pacific Bell	
Fiber Beyond the Feeder Pre-Approval Requirement	
COLORADO	
- Mountain Bell Telephone Company	
General Rate Case	Docket No. 96A-218T et al.
Call Trace Case	Docket No. 92S-040T
Caller ID Case	Docket No. 91A-462T
General Rate Case	Docket No. 90S-544T
Local Calling Area Case	Docket No. 1766
General Rate Case	Docket No. 1720
General Rate Case	Docket No. 1700
General Rate Case	Docket No. 1655
General Rate Case	Docket No. 1575
Measured Services Case	Docket No. 1620
- Independent Telephone Companies	
Cost Allocation Methods Case	Docket No. 89R-608T
DELAWARE	
- Diamond State Telephone Company	
General Rate Case	PSC Docket No. 82-32
General Rate Case	PSC Docket No. 84-33
Report on Small Centrex	PSC Docket No. 85-32T

General Rate Case	PSC Docket No. 86-20
Centrex Cost Proceeding	PSC Docket No. 86-34

DISTRICT OF COLUMBIA

- C&P Telephone Company of D.C.	
Depreciation issues	Formal Case No. 926

FCC

- Review of jurisdictional separations	FCC Docket No. 96-45
- Developing a Unified Intercarrier Compensation Regime	CC Docket No. 01-92

FLORIDA

- BellSouth, GTE, and Sprint	
Fair and reasonable rates	Undocketed Special Project

GEORGIA

- Southern Bell Telephone & Telegraph Co.	
General Rate Proceeding	Docket No. 3231-U
General Rate Proceeding	Docket No. 3465-U
General Rate Proceeding	Docket No. 3286-U
General Rate Proceeding	Docket No. 3393-U

HAWAII

- GTE Hawaiian Telephone Company	
Depreciation/separations issues	Docket No. 94-0298
Resale case	Docket No. 7702

ILLINOIS

- Verizon North Inc. and Verizon South Inc. DSL Waiver Petition Proceeding	Docket No. 02-0560
- Geneseo Telephone Company	
EAS case	Docket No. 99-0412
- Central Telephone Company	
(Staunton merger)	Docket No. 78-0595
- General Telephone & Electronics Co.	
Usage sensitive service case	Docket Nos. 98-0200/98-0537
General rate case (on behalf of CUB)	Docket No. 93-0301
(Usage sensitive rates)	Docket No. 79-0141
(Data Service)	Docket No. 79-0310
(Certificate)	Docket No. 79-0499
(Certificate)	Docket No. 79-0500

- General Telephone Co.	Docket No. 80-0389
- Ameritech (Illinois Bell Telephone Company)	
Alternative Regulation Review	Docket No. 98-0252
Area code split case	Docket No. 94-0315
General Rate Case	Docket No. 83-0005
(Centrex filing)	Docket No. 84-0111
General Rate Proceeding	Docket No. 81-0478
(Call Lamp Indicator)	Docket No. 77-0755
(Com Key 1434)	Docket No. 77-0756
(Card dialers)	Docket No. 77-0757
(Concentration Identifier)	Docket No. 78-0005
(Voice of the People)	Docket No. 78-0028
(General rate increase)	Docket No. 78-0034
(Dimension)	Docket No. 78-0086
(Customer controlled Centrex)	Docket No. 78-0243
(TAS)	Docket No. 78-0031
(Ill. Consolidated Lease)	Docket No. 78-0473
(EAS Inquiry)	Docket No. 78-0531
(Dispute with GTE)	Docket No. 78-0576
(WUI vs. Continental Tel.)	Docket No. 79-0041
(Carle Clinic)	Docket No. 79-0132
(Private line rates)	Docket No. 79-0143
(Toll data)	Docket No. 79-0234
(Dataphone)	Docket No. 79-0237
(Com Key 718)	Docket No. 79-0365
(Complaint - switchboard)	Docket No. 79-0380
(Porta printer)	Docket No. 79-0381
(General rate case)	Docket No. 79-0438
(Certificate)	Docket No. 79-0501
(General rate case)	Docket No. 80-0010
(Other minor proceedings)	Docket No. various
- Home Telephone Company	Docket No. 80-0220
- Northwestern Telephone Company	
Local and EAS rates	Docket No. 79-0142
EAS	Docket No. 79-0519

INDIANA

- Public Service of Indiana (PSI)	
Depreciation issues	Cause No. 39584
- Indianapolis Power and Light Company	
Depreciation issues	Cause No. 39938

IOWA

- U S West Communications, Inc.	
Local Exchange Competition	Docket No. RMU-95-5
Local Network Interconnection	Docket No. RPU-95-10
General Rate Case	Docket No. RPU-95-11

KANSAS

- Southwestern Bell Telephone Company	
Commission Investigation of the KUSF	Docket No. 98-SWBT-677-GIT
- Rural Telephone Service Company	
Audit and General rate proceeding	Docket No. 00-RRLT-083-AUD
Request for supplemental KUSF	Docket No. 00-RRLT-518-KSF
- Southern Kansas Telephone Company	
Audit and General rate proceeding	Docket No. 01-SNKT-544-AUD
- Pioneer Telephone Company	
Audit and General rate proceeding	Docket No. 01-PNRT-929-AUD
- Craw-Kan Telephone Cooperative, Inc.	
Audit and General rate proceeding	Docket No. 01-CRKT-713-AUD
- Sunflower Telephone Company, Inc.	
Audit and General rate proceeding	Docket No. 01-SFLT-879-AUD
- Bluestem Telephone Company, Inc.	
Audit and General rate proceeding	Docket No. 01-BSST-878-AUD
- Home Telephone Company, Inc.	
Audit and General rate proceeding	Docket No. 02-HOMT-209-AUD
- Wilson Telephone Company, Inc.	
Audit and General rate proceeding	Docket No. 02-WLST-210-AUD
- S&T Telephone Cooperative Association, Inc.	
Audit and General rate proceeding	Docket No. 02-S&TT-390-AUD
- Blue Valley Telephone Company, Inc.	
Audit and General rate proceeding	Docket No. 02-BLVT-377-AUD
- JBN Telephone Company	
Audit and General rate proceeding	Docket No. 02-JBNT-846-AUD
- S&A Telephone Company	
Audit and General rate proceeding	Docket No. 03-S&AT-160-AUD

MAINE

- New England Telephone Company	
General rate proceeding	Docket No. 92-130

MARYLAND

- Chesapeake and Potomac Telephone Company	
General rate proceeding	Docket No. 7851
Cost Allocation Manual Case	Case No. 8333
Cost Allocation Issues Case	Case No. 8462

- Verizon Maryland	
PICC rate case	Case No. 8862
USF case	Case No. 8745

MINNESOTA

- Access charge (all companies)	Docket No. P-321/CI-83-203
- U. S. West Communications, Inc. (Northwestern Bell Telephone Co.)	
Centrex/Centron proceeding	Docket No. P-421/91-EM-1002
General rate proceeding	Docket No. P-321/M-80-306
Centrex Dockets	MPUC No. P-421/M-83-466
	MPUC No. P-421/M-84-24
	MPUC No. P-421/M-84-25
	MPUC No. P-421/M-84-26
General rate proceeding	MPUC No. P-421/GR-80-911
General rate proceeding	MPUC No. P-421/GR-82-203
General rate case	MPUC No. P-421/GR-83-600
WATS investigation	MPUC No. P-421/CI-84-454
Access charge case	MPUC No. P-421/CI-85-352
Access charge case	MPUC No. P-421/M-86-53
Toll Compensation case	MPUC No. P-999/CI-85-582
Private Line proceeding	Docket No. P-421/M-86-508
- AT&T	
Intrastate Interexchange	Docket No. P-442/M-87-54

MISSISSIPPI

- South Central Bell	
General rate filing	Docket No. U-4415

MISSOURI

- Southwestern Bell	
General rate proceeding	TR-79-213
General rate proceeding	TR-80-256
General rate proceeding	TR-82-199
General rate proceeding	TR-86-84
General rate proceeding	TC-89-14, et al.
Alternative Regulation	TC-93-224/TO-93-192
- United Telephone Company	
Depreciation proceeding	TR-93-181
- All companies	
Extended Area Service	TO-86-8
EMS investigation	TO-87-131
Cost of Access Proceeding	TR-2001-65

APPENDIX A

NEW JERSEY

- New Jersey Bell Telephone Company	
General rate proceeding	Docket No. 802-135
General rate proceeding	BPU No. 815-458
	OAL No. 3073-81
Phase I - General rate case	BPU No. 8211-1030
	OAL No. PUC10506-82
General rate case	BPU No. 848-856
	OAL No. PUC06250-84
Division of regulated	BPU No. TO87050398
from competitive services	OAL No. PUC 08557-87
Customer Request Interrupt	Docket No. TT 90060604

NEW MEXICO

- U.S. West Communications, Inc.	
E-911 proceeding	Docket No. 92-79-TC
General rate proceeding	Docket No. 92-227-TC
General rate/depreciation proceeding	Case No. 3008
Subsidy Case	Case No. 3325
USF Case	Case No. 3223
- VALOR Communications	
Subsidy Case	Case No. 3300

OHIO

- Ohio Bell Telephone Company	
General rate proceeding	Docket No. 79-1184-TP-AIR
General rate increase	Docket No. 81-1433-TP-AIR
General rate increase	Docket No. 83-300-TP-AIR
Access charges	Docket No. 83-464-TP-AIR
- General Telephone of Ohio	
General rate proceeding	Docket No. 81-383-TP-AIR
- United Telephone Company	
General rate proceeding	Docket No. 81-627-TP-AIR

OKLAHOMA

- Public Service of Oklahoma	
Depreciation case	Cause No. 96-0000214

PENNSYLVANIA

- GTE North, Inc.	
Interconnection proceeding	Docket No. A-310125F002
- Bell Telephone Company of Pennsylvania	

Alternative Regulation proceeding	Docket No. P-00930715
Automatic Savings	Docket No. R-953409
Rate Rebalance	Docket No. R-00963550
- Enterprise Telephone Company	
General rate proceeding	Docket No. R-922317
- All companies	
InterLATA Toll Service Invest.	Docket No. I-910010
Joint Petition for Global Resolution of Telecommunications Proceedings	Docket Nos. P-00991649, P-00991648, M-00021596
- GTE North and United Telephone Company	
Local Calling Area Case	Docket No. C-902815
- Verizon	
Joint Application of Bell Atlantic and GTE for Approval of Agreement and Plan of Merger	Docket Nos. A-310200F0002, A-311350F0002, A-310222F0002, A-310291F0003

SOUTH DAKOTA

- Northwestern Bell Telephone Company	
General rate proceeding	Docket No. F-3375

TENNESSEE

(on behalf of Time Warner Communications)

- BellSouth Telephone Company	
Avoidable costs case	Docket No. 96-00067

UTAH

- U.S. West Communications (Mountain Bell Telephone Company)	
General rate case	Docket No. 84-049-01
General rate case	Docket No. 88-049-07
800 Services case	Docket No. 90-049-05
General rate case/ incentive regulation	Docket No. 90-049-06/90-049-03
General rate case	Docket No. 92-049-07
General rate case	Docket No. 95-049-05
General rate case	Docket No. 97-049-08
Qwest Price Flexibility-Residence	Docket No. 01-2383-01
Qwest Price Flexibility-Business	Docket No. 02-049-82

VIRGIN ISLANDS, U.S.

- Virgin Islands Telephone Company	
General rate case	Docket No. 264
General rate case	Docket No. 277
General rate case	Docket No. 314

General rate case	Docket No. 316

VIRGINIA

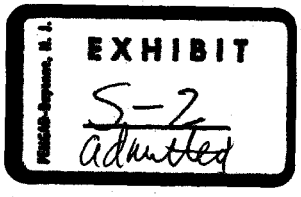
- General Telephone Company of the South	
Jurisdictional allocations	Case No. PUC870029
Separations	Case No. PUC950019

WASHINGTON

- US West Communications, Inc.	
Interconnection case	Docket No. UT-960369
General rate case	Docket No. UT-950200
- All Companies-	Analyzed the local calling areas in the State

WISCONSIN

- Wisconsin Bell Telephone Company	
Private line rate proceeding	Docket No. 6720-TR-21
General rate proceeding	Docket No. 6720-TR-34



BEFORE THE

ARIZONA CORPORATION COMMISSION

IN THE MATTER OF THE GENERIC INVESTIGATION INTO U S WEST COMMUNICATIONS, INC.'S NKA QWEST CORPORATION, COMPLIANCE WITH CERTAIN WHOLESALE PRICING REQUIREMENTS FOR UNBUNDLED NETWORK ELEMENTS AND RESALE DISCOUNTS	)	DOCKET NO. T-00000A-00-0194

REBUTTAL TESTIMONY AND SCHEDULES

OF

WILLIAM DUNKEL

ON BEHALF OF

THE STAFF OF THE ARIZONA CORPORATION COMMISSION

MAY 12, 2003

Q. ARE YOU THE SAME WILLIAM DUNKEL WHO PREVIOUSLY FILED DIRECT TESTIMONY IN THIS PROCEEDING ON BEHALF OF THE STAFF?

A. Yes.

Q. WHAT IS THE PURPOSE OF THIS REBUTTAL TESTIMONY?

A. The purpose of this Rebuttal Testimony is to respond to the Direct Testimonies filed by other parties in this preceding.

I. THE SWITCHING EQUIPMENT IS NOT 100% "PORT"

Q. IN THE GILLAN-CHANDLER TESTIMONY, MCI AND AT&T PROPOSE THAT THE SWITCHING EQUIPMENT BE CONSIDERED 100% PORT. DO YOU AGREE WITH THIS RECOMMENDATION?

A. No. A portion of the switch investment has the function of switching usage. Therefore, a portion of the switch costs is usage cost, not port cost.

Q. DOES THE GILLAN-CHANDLER TESTIMONY ACKNOWLEDGE THAT A PORTION OF THE SWITCHING EQUIPMENT HAS THE FUNCTION OF SWITCHING TRAFFIC?

A. Yes. On page 11 of their Direct Testimony, Gillan-Chandler properly state:

> The switch fabric provides connection paths between ports; it connects lines to lines, lines to trunks, trunks to lines, and trunks to trunks.

On page 13 of their Testimony regarding the "switch fabric", Gillan-Chandler state:

> Its capacity limit is thus affected by traffic and is usually expressed in traffic terms, either Erlangs or CCS.

On page 18 of their Direct, Gillan-Chandler state:

> An ILEC will obviously not install switches with maximum capacity in all wire centers.

Therefore, Gillan-Chandler acknowledge that an ILEC will size the switch based upon the expected usage in that wire center.

On Page 20 of their Direct, Gillan-Chandler state

> ...that review demonstrates that Qwest purchases switching by paying a flat-rate, albeit a flat-rate that may increase as the capability of the switch increases.

Q. WHAT DO THE ABOVE STATEMENTS INDICATE?

A. The above statements indicate that: (1) a portion of the switch investment, including the "switch fabric" is for the purpose of switching usage, and (2) the Qwest investment in the switch does depend on the level of usage the switch is designed to handle. In short, part of the investment in the switch is investment that is made for the purpose of switching usage. The costs associated with this portion of the switch are usage-related costs. They are not "port" or a line related costs.

Q. WHAT DOES THE GILLAN-CHANDLER TESTIMONY ARGUE PERTAINING TO THE COSTS OF THE "SWITCH FABRIC" THAT IS USED TO SWITCH USAGE?

A. On pages 16, 17, 18 and 20 of their Testimony, Gillan and Chandler argue that switches are initially installed with enough usage capacity so that usage capacity is seldom

exceeded. Then they argue that since the initial usage investment is made at a high enough level to handle the expected usage, that usage investment is no longer a usage-related cost. For example, on page 17 of their testimony they state:

> Forward-looking switches contain very robust control and switch fabric capacities that are not exhausted by realistic subscriber usage.

On page 20, they state:

> The fact that Qwest pays more (on a flat rate basis) for a switch with more capability than another switch, however, is not a reasonable basis to impose a usage cost on CLECs sharing those same switches each and every time their subscriber makes (or receives) a call.

"Capability" means capacity to switch usage.

Q. IS THIS ARGUMENT VALID?

A. No. Proper cost recovery is on the basis of "cost causation". Costs that are incurred for the purpose of switching usage are "usage" related costs, and should be recovered in "usage" rates. The fact that the company installs a high level of usage switching capacity at the time of initial switch installation does not change the fact that this usage investment is made for the purpose of switching usage. The fact that the investment is made at the time of initial installation does not make the costs of that usage-related investment zero. The investors that funded the switching fabric[1] investment expect a return on their investment. Since that investment is being used to switch usage, rates that are based on usage are the appropriate source for that return on investment. In addition, the investment used to switch usage depreciates over time. The depreciation expense of the usage switching equipment is properly recovered from usage rates. Likewise,

[1] "Switch fabric" is not the only investment that is for usage. For example, certain trunk investments depend upon the level of usage and therefore are usage related investments.

maintenance expense and other expenses of the equipment that is used to switch usage are also properly recovered from usage rates.

Q. PLEASE SUMMARIZE YOUR POSITION ON THIS ISSUE.

A. A portion of the switching equipment investment is related to the lines. This investment is generally called the "port". The port costs are reasonably recovered in "per month, per line" fixed charges. However, other parts of the switch investments are used to switch usage. These costs are usage-related, and should be recovered in usage charges. The MCI/AT&T proposal to consider the switch as 100 percent "port" and zero percent "usage" is incorrect and does not reflect actual cost causation.

At this point, I have not seen any evidence that would cause a change in the allocation contained in the Commission Order, which is 60 percent port, 40 percent usage.

Q. DOES THE "PER MINUTE" USAGE RATE PLACE AT&T AND MCI AT ANY IMPROPER DISADVANTAGE?

A. No. It would take over 1600 minutes of average usage per line, per month for the per-minute charges to exceed the additional port rate that AT&T and MCI are proposing. This is shown on Schedule WDA-2. This number is the same as the average per line usage in the HAI model. Therefore, unless AT&T and/or MCI are planning to sign up a disproportionate share of high-volume customers (such as telemarketers), paying the "per minute' rate should not place them at any disadvantage.

Of course, if AT&T and/or MCI are planning to signing up a disproportionate share of high-volume customers (such as telemarketers) then the average usage per line they would generate would be above average, and the usage costs they would be causing would be above average. Under those conditions it would be appropriate for them to support the associated higher than average usage costs.

Q. ON PAGE 12 OF THE MILLION DIRECT, QWEST ADDRESSES THE ALLEGED SOURCE OF THE $1.61 PORT RATE. WHAT IS THE ACTUAL SOURCE OF THE $1.61 PORT RATE?

A. $1.61 was the port rate that was previously in effect. As was stated on page 16 of the Commission Phase IIA Order, the Commission decided to continue to use the existing port rate, because it was within the range established by the parties. However, Qwest later demonstrated that the sum of the $1.61 port rate plus the usage rates did not cover 100% of the switching equipment costs ("costs" as determined by the HAI).

As discussed in my Direct Testimony, Staff supports recovering 100% of the properly calculated switching equipment costs.

II. THE UNE LOOP RATES SHOULD NOT BE CHANGED BY $0.12

Q. THE DIRECT TESTIMONY OF MR. DENNEY STATES THAT 12 CENTS PER LINE OF THE "NETWORK OPERATION" EXPENSE WAS TRANSFERRED FROM "LOOPS" TO "SWITCHING" IN THE PHASE IIA RUNS. MR. DENNEY

RECOMMENDS THAT THE AVERAGE UNE LOOP RATE BE REDUCED FROM $12.11 TO $11.99 TO CORRECT THIS PROBLEM, AS SHOWN ON SCHEDULE WDA-1. DO YOU AGREE WITH THAT RECOMMENDATION?

A. No. The UNE loop rates were previously set, and there is no reason to revisit them now. The April 11, 2003 Procedural Order which established this proceeding makes no reference to addressing the UNE loop rates in this proceeding. According to that Order, the only rates to be addressed in this proceeding are (1) the DS1 and DS3 transport/entrance facility rates and (2) the port and usage rates.

If $0.12 per line of overhead that were previously included in the "Loop" runs are also included in the new "Switching" runs, the obvious way to solve that problem is to not include that $0.12 in the new "Switching" runs. Instead of reopening the loop rates, I recommend that this $0.12 per line per month of the network operations expense that is already recovered in the UNE loop rates not be recovered in the "switch" rates (port and usage rates).

The $2.44 per line per month "port" rate and the $0.00097 per minute usage rates[2] include this $0.12 per line of overhead cost that is already included in the UNE loop rates. If these rates are recalculated without including this double recovery, the revised rates are $2.36 per line "port" and $0.00094 per minute, as shown on the attached Schedule WDA-3. These are the rates I recommend.

[2] Qwest Notice of Filing in Compliance with Decision No. 65451, Exhibit A, page 1. These are the rates at 60% port, 40% usage, which is the split established in the Commission Order.

Q. Does this conclude your Rebuttal Testimony?

A. Yes.

QWEST ARIZONA UNE LOOP RATES

	(A) Current UNE Loop Rate (1)	(B) AT&T Proposed UNE Loop Rate (2)	(C = A-B) Difference
Statewide Average	$12.11	$11.99	$ 0.12
Zone 1	$9.05	$8.97	$ 0.08
Zone 2	$14.84	$14.72	$ 0.12
Zone 3	$36.44	$36.14	$ 0.30

(1) AT&T/WorldCom Submission of HAI Model Run Using Qwest 2000 Data and Conditional Request for Rehearing, May 24, 2002, Exhibit A, Page 5.

(2) Direct Testimony of Douglas Denney on Behalf of AT&T, April 28, 2003, Page 7.

CALCULATION OF THE AVERAGE USAGE NEEDED TO MAKE UP THE DIFFERENCE BETWEEN QWEST'S AND AT&T'S PROPOSED PORT RATES

	Monthly Port Rate		Per Minute Usage Rate			
AT&T Proposal (1)	$ 4.06		$ -			
Qwest Proposal (2)	$ 2.44		$ 0.00097			
Difference	$ 1.62	divided by	$ 0.00097	=	1,670	= Average Usage Needed To Make Up Difference Between Qwest and AT&T Proposed Rates (in minutes).

(1) Direct Testimony of Douglas Denney on Behalf of AT&T, Page 7.

(2) Qwest Corporation's Notice of Filing in Compliance with Decision No. 65451, Exhibit A, Page 1, January 10, 2003.

CALCULATION OF SWITCHING RATES

CALCULATED TO ADJUST FOR OVER RECOVERY OF NETWORK OPERATIONS EXPENSES

	Annual Cost (a)	% Assignment	Units (b)		Cost (c) = (a)/(b)	
HAI MODEL OUTPUT						
End office switching	144,259,313	100%				
Line Port	86,555,588	60%	2,959,791	switched lines	2.44	per line/month
Non-Line Port	57,703,725	40%	62,141,633,323	actual minutes	0.00093	per actual minute
					0.00097	using 1.044 DEM to Billed MOU Ratio
DEDUCT 12 CENTS PER SWITCHED LINE PER MONTH						
End office switching (1)	(4,262,099)	100%				
Line Port	(2,557,259)	60%	2,959,791	switched lines	(0.07)	per line/month
Non-Line Port	(1,704,840)	40%	62,141,633,323	actual minutes	(0.00003)	per actual minute
					(0.00003)	using 1.044 DEM to Billed MOU Ratio
PROPOSED SWITCHING RATES						
End office switching (2)	139,997,214	100%				
Line Port	83,998,328	60%	2,959,791	switched lines	2.36	per line/month
Non-Line Port	55,998,886	40%	62,141,633,323	actual minutes	0.00090	per actual minute
					0.00094	using 1.044 DEM to Billed MOU Ratio

Notes:
(1) $0.12 * 2,959,791 lines * 12 months = $4,262,099
(2) HAI Model output minus $0.12 cents per switched line per month

Sources:
HAI Model output Annual Cost and Units from Attachment DKD-01 of Doug Denney's Direct Testimony

ARIZONA DOCKET NO. T-00000A-00-0194
AT&T COMMUNICATIONS OF THE MOUNTAIN STATES, INC.'S RESPONSE TO ARIZONA CORPORATION COMMISSION STAFF'S FIFTH SET OF DATA REQUESTS REGARDING THE DIRECT TESTIMONY OF DOUGLAS DENNEY

DATA REQUEST 5-1:

On pages 5 to 7 of your Direct Testimony you discuss 12 cents of network operations expense. Is this a certain type of overhead that's allocated in the studies?

RESPONSE TO DATA REQUEST 5.1:

Yes. Network Operations expense in the HAI Model includes the expenses for Provisioning, Power, Network Administration, Testing, Plant Operations Administration, and Engineering.

DATA REQUEST 5.2:

Is it your position that 12 cents of this overhead costs which was included in the loop costs in Phase II is also included in the $4.06 port costs in the recent runs?

RESPONSE TO DATA REQUEST 5.2:

Yes. The total amount of Network Operations expense determined in the model is a fixed flat dollar amount per line. The $4.06 port cost includes 12 cents of the fixed Network Operations expenses that were already assigned to the loop in the prior phase of this case.

DATA REQUEST 5.3:

In your testimony you propose that we should go back and adjust the previously approved loop rates by 12 cents per line per month. Is it correct that instead of adjusting the loop rates, we could adjust the port rate by $0.12?

RESPONSE TO DATA REQUEST 5.3:

Yes.

ARIZONA DOCKET NO. T-00000A-00-0194
AT&T COMMUNICATIONS OF
THE MOUNTAIN STATES, INC.'S
RESPONSE TO
ARIZONA CORPORATION COMMISSION STAFF'S
FIFTH SET OF DATA REQUESTS REGARDING THE DIRECT TESTIMONY
OF DOUGLAS DENNEY

DATA REQUEST 5.4:

Is it correct that the port rate is one of the rates that is at issue in this hearing?

RESPONSE TO DATA REQUEST 5.4:

Yes.

DATA REQUEST 5.5:

Other witnesses discuss the "trunk" ports (i.e. Gillan Direct page 22). Is it correct that these "trunk" ports connect the switch to interoffice facilities?

RESPONSE TO DATA REQUEST 5.5:

This is my understanding; however, technical questions regarding trunk ports should be addressed to Mr. Chandler.

DATA REQUEST 5.6:

Are any trunk port costs included in the HAI model run that you attached to your Direct Testimony?

RESPONSE TO DATA REQUEST 5.6:

Yes. The switching costs estimated by the HAI Model include trunk port costs. The trunk port investments were part of the total switching investment that is used in the model, thus the trunk port costs are reflected in the switching cost estimates.

ARIZONA DOCKET NO. T-00000A-00-0194
AT&T COMMUNICATIONS OF
THE MOUNTAIN STATES, INC.'S
RESPONSE TO
ARIZONA CORPORATION COMMISSION STAFF'S
FIFTH SET OF DATA REQUESTS REGARDING THE DIRECT TESTIMONY
OF DOUGLAS DENNEY

DATA REQUEST 5.7:

Does the $4.06 per line cost that is calculated on the attachment to your Direct Testimony include any "trunk port" costs?

RESPONSE TO DATA REQUEST 5.7:

Yes. The $4.06 includes all of the necessary trunk port costs.

DATA REQUEST 5.8:

If not in the HAI, where are the "trunk" port costs included in the AT&T cost studies?

RESPONSE TO DATA REQUEST 5.8:

The $4.06 includes all trunk port costs.

Responses to Data Requests 5.1 – 5.8 were prepared by Douglas Denney or under his direction and control.

BEFORE THE ARIZONA CORPORATION COMMISSION

MARC SPITZER
Chairman
JAMES M. IRVIN
Commissioner
WILLIAM MUNDELL
Commissioner
JEFF HATCH-MILLER
Commissioner
MIKE GLEASON
Commissioner

2003 APR 29 A 10:32

IN THE MATTER OF INVESTIGATION INTO QWEST CORPORATION'S COMPLIANCE WITH CERTAIN WHOLESALE PRICING REQUIREMENTS FOR UNBUNDLED NETWORK ELEMENTS AND RESALE DISCOUNTS	DOCKET No. T-00000A-00-0194 **QWEST CORPORATION'S NOTICE OF FILING TESTIMONY OF TERESA K. MILLION**

Qwest Corporation ("Qwest") hereby provides notice of filing the Direct Testimony of Teresa K. Million in the above referenced matter.

DATED this 29th day of April 2003.

FENNEMORE CRAIG

By _____
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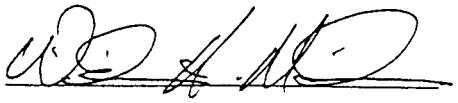

BEFORE THE ARIZONA CORPORATION COMMISSION

MARC SPITZER
CHAIRMAN
JAMES M. IRVIN
COMMISSIONER
WILLIAM A. MUNDELL
COMMISSIONER
JEFF HATCH-MILLER
COMMISSIONER
MIKE GLEASON
COMMISSIONER

IN THE MATTER OF INVESTIGATION INTO QWEST CORPORATION'S COMPLIANCE WITH CERTAIN WHOLESALE PRICING REQUIREMENTS FOR UNBUNDLED NETWORK ELEMENTS AND RESALE DISCOUNTS.	]]]]]]	**DOCKET NO. T-00000A-00-0194 PHASE II AND PHASE II-A**

DIRECT TESTIMONY OF

TERESA K. MILLION

ON BEHALF OF

QWEST CORPORATION

APRIL 28, 2003

TESTIMONY INDEX

I. IDENTIFICATION OF WITNESS

Q. PLEASE STATE YOUR NAME, BUSINESS ADDRESS, AND POSITION WITH QWEST CORPORATION.

A. My name is Teresa K. (Terri) Million. My business address is 1801 California Street, Room 2050, Denver, Colorado 80202. I am employed by Qwest Services Corporation as a Director, Service Costs, in the Policy and Law Department. In this position, I am responsible for preparing testimony and testifying about Qwest's cost studies in a variety of regulatory proceedings.

Q. HAVE YOU PREVIOUSLY FILED TESTIMONY IN THIS PROCEEDING?

A. Yes. On April 24, 2000, I filed direct testimony in Phase I of this proceeding. I also filed direct and rebuttal testimony in Phase II of this proceeding.

II. PURPOSE OF TESTIMONY

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my testimony is to address the questions regarding the transport rate and analog port rate raised in the Stipulation Concerning Expedited Hearing on Transport and Analog Port Rates ("Stipulation"). Specifically, the Stipulation asks: 1) whether the Staff's Option 1 or Option 2 should be adopted for DS1 and DS3 transport rates until the rates are reconsidered in Phase III of the Cost Docket; 2) what the appropriate effective date of the rates should be;

and 3) what the appropriate analog port rate is, including the allocation of switching costs between the port rate and the usage rates.

III. TRANSPORT RATES

Q. WHAT IS YOUR POSITION REGARDING WHICH OF STAFF'S TWO OPTIONS THE COMMISSION SHOULD ADOPT AS THE RATES FOR DS1 AND DS3 TRANSPORT RATES?

A. Staff's Option 1 would set the transport rates to the rates that were in effect prior to the current Cost Docket, while Staff's Option 2 would use the transport rates adopted in Decision No. 64922. Under Option 2 the combined transport rates adopted in the Order would be disaggregated into two rates:

1. An entrance facility rate (also the EUDIT rate) that would cover the cost of the facility linking the CLEC central office or point of presence to the Qwest central office in which the circuit terminates; and

2. A direct trunk transport (also UDIT) rate to cover the costs of circuits between Qwest central offices.

To determine these transport rates, it is necessary to break out the total transport costs produced by HAI into these two elements. A logical way to divide these costs is to use the same ratio of entrance facility to direct trunk transport costs that were in effect prior to the cost docket and apply that ratio to the total

transport costs produced by HAI. Under this approach, the direct trunk transport rate is calculated by multiplying one minus the entrance facility ratio times the total HAI transport cost. The effect of this calculation is to remove the entrance facility cost from the total HAI transport cost, resulting in separate rates for direct trunk transport and entrance facilities. The calculations of the entrance facility ratios and the DS1 and DS3 transport rates resulting from application of those ratios to the total HAI transport costs are as follows:

Calculation of DS1 Ratio

DS1 entrance facility ratio = 89.42/(89.42+35.99+(11*0.94)) = 0.658711

Calculation of DS1 Transport Rate

DS1 transport rate = (1-0.658711) * 151.89 = $51.84

Calculation of DS3 Ratio

DS3 entrance facility ratio = 357.16/(357.16+246.16+(11*15.90)) = 0.458945

Calculation of DS3 Transport Rate

DS3 transport rate = (1-0.458945) * 1818.49 = $983.90

The entrance facility rates resulting from these calculations are determined by subtracting the DS1 and DS3 transport rates calculated above from the total HAI transport costs. Thus, the DS1 entrance facility rate is $100.05, and the DS3 entrance facility rate is $834.59.

Accordingly, the Commission should adopt Staff's Option 2 and use the combined entrance facility/direct trunk transport rates adopted by the Commission as the basis for calculating separate rates for entrance facilities and direct trunk transport. The rates listed above result from this approach.

Q. WHY DO YOU BELIEVE THAT THE COMMISSION SHOULD REJECT STAFF'S OPTION 1?

A. In its Phase II Order, the Commission ruled that the HAI model would be used to determine the costs and rates for unbundled network elements (UNEs), stating that HAI "provides the most appropriate measure of determining TELRIC-compliant, forward-looking costs and prices for UNEs...."[1] In reaching this result, the Commission considered and expressly rejected AT&T's claim that while HAI should be used for other UNEs, it should not be used for transport. The Commission stated its conclusion very clearly: "We believe that consistency requires adoption of the HAI model's results for both loop costs and transport."[2] By resurrecting the transport rates that were in effect before the Phase II Order, Staff's Option 1 would violate this ruling from the Phase II Order and produce the very inconsistency that the Commission sought to avoid in the first place by using HAI for transport. As the Commission's ruling reflects, it would be inconsistent and unfair to use HAI when it produces costs and rates that are favorable to the

[1] Phase II Opinion and Order, Decision No. 64922 at 10-11.

[2] *Id.* at 79.

CLECs but not to use it when CLECs (including the CLECs that sponsored the model) object to the costs and rates it produces.

In addition, there is a direct relationship between the costs that the HAI model calculates for the unbundled loop and the costs the model generates for other UNEs, including transport. One reason that HAI produces lower loop costs is that the model allocates various expense factors to the non-loop facility costs it produces in proportion to their estimated direct costs. For example, if HAI produces direct costs for transport that are three times higher than the corresponding direct costs for loop, then for $100 of overhead expenses HAI would allocate $25 of expenses to the loop and $75 of expenses to transport. This method of allocation assumes that in order to recover the entire $100 in expense, Qwest must be able to charge the rates produced by HAI for both the loop and transport. A "pick and choose" approach to selecting Qwest's loop and transport rates, combined with HAI's already-understated overhead costs, would lead to a substantial under-recovery of overhead costs in the rates Qwest would be required to charge. Accordingly, the Commission should reject Staff's Option 1.

Q. THE SECOND ISSUE CONCERNS THE DATE ON WHICH THE RATES RESULTING FROM THIS PROCEEDING SHOULD BECOME EFFECTIVE. WHEN DO YOU BELIEVE THESE RATES SHOULD BECOME EFFECTIVE?

A. The revised rates should become effective from the date when the Commission order from this proceeding establishing the rates becomes effective. The revised rates should not be applied retroactively. The existing rates the Commission adopted are permanent rates; nothing in Decision No. 64922 or any other orders in this docket suggests that these rates are interim. While the Commission has decided to revisit these existing rates after having been in effect for a relatively short time, that decision does not alter the fact the existing rates are permanent and not subject to true-up in this circumstance. I will leave the legal analysis to others, but I am familiar with the legal prohibition against retroactive ratemaking that would seem to prohibit the type of retroactive application of these rates that some parties to this proceeding are apparently advocating. The fact is that unless or until the Commission adopts a revised rate for these elements, the rates that Qwest currently charges are appropriate under the Commission's current order, have not been identified as interim rates, and should not be subject to true-up.

Q. ARE THERE OTHER REASONS THAT RETROACTIVE APPLICATION OF THE RATES ESTABLISHED IN THIS PROCEEDING IS INAPPROPRIATE?

A. Yes. The interconnection agreements that Qwest has with CLECs often specifically address whether, and how, changes in rates ordered by the Commission will be incorporated into individual agreements. Indeed, CLECs that have purchased the UNEs at issue in this proceeding typically did so pursuant to

Commission-approved interconnection agreements. Those agreements establish the applicable rates, the period during which the rates apply, and the circumstances, if any, under which the rates would change during the term of an agreement. The terms of each agreement determine whether a retroactive rate adjustment is permissible and, therefore, each agreement must be reviewed individually to determine applicability of a specific adjustment.

Q. IF THE COMMISSION WERE TO APPLY MODIFIED TRANSPORT RATES RETROACTIVELY, WOULD CONSISTENCY REQUIRE THE SAME TREATMENT FOR THE MODIFIED SWITCHING RATES?

A. Yes. While Qwest opposes giving retroactive effect to any of the rates, any retroactivity requirement imposed by the Commission would have to apply to all modified rates resulting from this proceeding. There would be no principled basis for making some rates retroactive but not others.

IV. ANALOG PORT RATES

Q. WHAT IS THE APPROPRIATE ALLOCATION OF SWITCHING COSTS BETWEEN THE PORT RATE AND USAGE RATES?

A. Although Qwest believes that a larger percentage of the cost of switching should be allocated to usage than the Commission ordered in its Phase IIA Order,

Qwest accepts the Commission's adoption of a ratio that assigns 60% of costs to the port rate and 40% to usage.[3]

Q. PLEASE EXPLAIN HOW THE COMMISSION'S ORDER IN PHASE IIA (DECISION NO. 65451) RESULTED IN THE PORT AND USAGE ALLOCATIONS LISTED ABOVE.

A. In adopting the HAI 5.2a model for use in determining Qwest's TELRIC rates, the Commission affirmed that unless otherwise indicated within the text of Decision No. 65451, the HAI model inputs advocated by the CLECs would be adopted for purposes of setting UNE rates in Phase IIA of the cost docket: "Consistent with our Decision in Phase II (Decision No. 64922), unless otherwise indicated in the discussion of issues that follows below, the HAI model inputs advocated by the CLECs shall be adopted for purposes of setting UNE rates in this Phase IIA proceeding."[4]

The Commission went on to specifically discuss and change four CLEC-proposed inputs related to switching costs. These inputs include switch fill factors, the analog circuit offset, the use of billable minutes instead of Dial Equipment Minutes (DEMs), and the ratio of port cost to usage cost. In ruling on the port cost/usage cost ratio, the Commission modified HAI's assignment of

[3] *See* Phase IIA Opinion and Order, Decision No. 65451 at 18.

[4] *Id.* at 6.

70% of the costs to usage and 30% to the port by requiring the parties to assign 60% to the port and 40% to usage.[5]

Using these four modified switching inputs the Commission ordered in Decision No. 65451, I have generated the attached HAI compliance run (Exhibit TKM-1) to calculate the results. Thus, the HAI cost results that utilize the Commission-ordered inputs should be the Commission's ordered UNE rates for analog ports and usage. This approach is consistent with the approach the Commission used to determine other rates produced by the HAI model, including the rate for the unbundled loop.

Q. WHAT SPECIFIC INPUT VALUES DID YOU USE IN YOUR RUN OF THE HAI MODEL TO DETERMINE THE PORT AND USAGE RATES THAT RESULT FROM THE COMMISSION'S ADOPTION OF HAI AND SWITCHING INPUT RULINGS IN DECISION NO. 65451?

A. With respect to switch fill factors, the Commission adopted "Qwest's proposed fill factors for purposes of this proceeding."[6] The Qwest proposed fill factor for switching that was adopted by the Commission is 80%. For the analog line circuit offset, the Commission determined that the CLECs had not "presented sufficient evidence in this case to support their claim that an additional offset for

[5] *Id.* at 17-18.

[6] *Id.* at 9.

analog line circuit should be included."[7] Therefore, in Exhibit TKM-1 the value for the analog circuit offset is set at $0. In discussing DEMs versus billable minutes, the Commission agreed with Qwest that "the billable minutes approach is appropriate for setting switching rates in this case."[8] Thus, Exhibit TKM-2 uses an adjustment factor of 1.044 to reflect the usage rate on the basis of billable minutes in calculating the appropriate switching cost. Finally, as discussed above, Exhibit TKM-1 assigns 60% of the switch cost to the port and 40% of the switch cost to usage as specified by the Commission in its Order.

Q. WHAT ARE THE ANALOG PORT AND USAGE RATES THAT RESULT FROM RUNNING THE HAI MODEL WITH THE INPUTS ORDERED BY THE COMMISSION IN DECISION NO. 65451?

A. The Commission's rulings in Decision No. 65451 produce an analog port rate of $2.44 and a switching per minute of use (MOU) rate of $0.00097.[9] AT&T concurs with Qwest[10] that the HAI model produces these costs when utilizing the Commission ordered inputs.

[7] *Id.* at 18.

[8] *Id.* at 20.

[9] The model actually produces a per MOU rate of $0.00093. However, after accounting for the Commission's ruling relating to the use of "billable minutes" instead of DEMs (Decision No. 65451 at 20), the per MOU rate increases to $0.00097.

[10] This concurrence was expressed by AT&T's counsel on January 27, 2003, during the Procedural Hearing on Phase IIA in Docket No. T-00000A-00-0194.

Q. IS THE PORT RATE OF $1.61 SET FORTH AT PAGE 16 OF DECISION NO. 65451 INCONSISTENT WITH THE COMMISSION'S RULINGS ON THE HAI SWITCHING INPUTS?

A. Yes. The port rate of $1.61 set forth in Decision No. 65451 does not reflect the Commission's rulings on switching inputs and cannot be generated by the HAI model using the Commission's rulings. The HAI model produces a total switching cost of $144,269,311. However, as demonstrated in Exhibit TKM-3, utilizing a rate of $1.61 for the analog port and assuming that the usage rate remains constant at $0.00097 allows Qwest to recover only $115,415,449 or 80% of the total switching cost produced by the HAI model. Thus, using the $1.61 port rate would prevent Qwest from recovering even the significantly understated switching costs that HAI produces. Otherwise, also demonstrated in Exhibit TKM-3, in order for Qwest to recover the $144,269,311 of switching cost produced in HAI with an analog port rate of $1.61, the usage rate would have to be $0.00146. In addition, from a cost modeling perspective, there is no principled justification for adhering strictly to the results produced by HAI using Commission-ordered inputs for some UNEs, such as the unbundled loop, but not adhering to the model's results for switching. Such a deviation, in my view, would violate the requirement that TELRIC rates must be based on cost.

Q. IS THERE A LOGICAL EXPLANATION AS TO WHY THE PORT RATE SPECIFIED IN THE COMMISSION'S ORDER LEADS TO RECOVERY OF ONLY 80% OF THE TOTAL SWITCHING COSTS PRODUCED BY HAI USING THE COMMISSION-ORDERED INPUTS?

A. Yes. In the December 9, 2002 Hearing, Staff witness Dunkel proposed and the Commission adopted the $1.61 port rate. In describing his calculation of this port rate, Mr. Dunkel stated "The next step is the ROO suggests 40 percent of switching costs go to [the] port."[11] In other words, it appears the Staff calculation that derived the $1.61 was premised on the inadvertent use of a 40% assignment of costs to the switch port as opposed to the 60% assignment specified as the proper input in the Commission's order. The Qwest compliance filing assigned 60% of the costs to the port and only 40% to the switch usage or per minute of use rate. By adopting the usage rate that was designed to recover only 40% of the costs as generated in Qwest's compliance run, and the $1.61 port rate generate by Staff that was designed to recover only 40% of the costs, the Commission has limited Qwest's recovery to only 80% of the switching costs produced in HAI.

Q. WHY ARE YOU CONFIDENT THAT THE STAFF INADVERTENTLY ONLY ASSIGNED 40% OF THE SWITCH COST TO THE PORT?

A. Mr. Dunkel gave a detailed explanation of how he calculated the $1.61 port rate. I have roughly duplicated his analysis, and I calculate the same result if I use the 40% port assignment he claimed he used in his analysis. In addition, Exhibit TKM-3 provides a run of the HAI model with the Commission-adopted inputs, with the sole exception that the port allocation is set at 40% instead of the 60%

[11] December 9, 2002 Transcript at 50.

ordered in Decision No. 65451. The HAI model run reflected in Exhibit TKM-3, with a 40% allocation of costs to the port, results in a port rate of $1.61, virtually the same rate calculated by Mr. Dunkel in the December 9, 2002 proceeding. It appears that Mr. Dunkel's "back of the envelope" calculations were very accurate if, as he claimed, he was determining the port rate using a 40% port allocation.

Q. IF 100% OF SWITCHING COSTS WERE ALLOCATED TO THE PORT, AS SOME PARTIES ARE LIKELY TO ADVOCATE, WHAT PORT RATE WOULD RESULT BASED ON THE INPUTS RULINGS IN DECISION NO. 65451?

A. Qwest opposes allocating all switching costs to the port for several reasons, including that such an allocation is not consistent with the fact that some switching costs are driven by usage. However, if all switching costs are allocated to the port and the Commission's other switching inputs from Decision No. 65451 are used, the HAI model produces a monthly recurring port rate of $4.06. This calculation is shown in Exhibit TKM-4.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes, it does.

BEFORE THE ARIZONA CORPORATION COMMISSION

MARC SPITZER
CHAIRMAN
JAMES M. IRVIN
COMMISSIONER
WILLIAM A. MUNDELL
COMMISSIONER
JEFF HATCH-MILLER
COMMISSIONER
MIKE GLEASON
COMMISSIONER

IN THE MATTER OF INVESTIGATION INTO QWEST CORPORATION'S COMPLIANCE WITH CERTAIN WHOLESALE PRICING REQUIREMENTS FOR UNBUNDLED NETWORK ELEMENTS AND RESALE DISCOUNTS.	]]]]]]	**DOCKET NO. T-00000A-00-0194 PHASE II AND PHASE II-A**

EXHIBITS OF

TERESA K. MILLION

April 28, 2003

BEFORE THE ARIZONA CORPORATION COMMISSION

MARC SPITZER
CHAIRMAN
JIM IRVIN
COMMISSIONER
WILLIAM A. MUNDELL
COMMISSIONER
MIKE GLEASON
COMMISSIONER
JEFF HATCH-MILLER
COMMISSIONER

IN THE MATTER OF QWEST CORPORATION'S TARIFF FILING TO INTRODUCE A NEW RATE STRUCTURE FOR AN ACCESS SERVICE USED BY INTEREXCHANGE CARRIERS	)	DOCKET NO. T-00000A-00-0194 Phase II & IIA AFFIDAVIT OF TERESA K. MILLION
STATE OF COLORADO	)	
COUNTY OF DENVER	)	

Teresa K. Million, of lawful age being first duly sworn, deposes and states:

1. My name is Teresa K. Million. I am Director – Services Cost in the Policy and Law organization of Qwest Services Corporation in Denver, Colorado. I have caused to be filed written testimony and exhibits in support of Qwest Corporation in Docket No. T-00000A-00-0194, Phases II and II-A.

2. I hereby swear and affirm that my answers contained in the attached testimony to the questions therein propounded are true and correct to the best of my knowledge and belief.

Further affiant sayeth not.

Teresa K. Million

SUBSCRIBED AND SWORN to before me this 24th day of April, 2003.

Notary Public residing at
Denver, Colorado

My Commission Expires: 7-12-06

	Annual Cost	Units		Cost	
End office switching	$ 144,269,311				
Line Port	86,561,587	2,959,791	switched lines	$ 2.44	per line/month
Non-Line Port	57,707,724	62,141,633,323	actual minutes	$ 0.00093	per actual minute (for rate per DEM, see "Cost detail" sheet)
Signaling network elements	$ 2,865,199				
Links	192,604	507	links	$ 31.66	per link per month
STP	2,234,461	41,094,682,805	TCAP+ISUP msgs	$ 0.00005	per signaling message
SCP	438,134	2,118,313,400	TCAP queries	$ 0.00021	per query
Transport network elements					
Dedicated					
Sw+Sp Transport	$ 9,115,815	333,511	trunks	$ 2.28	per DS-0 equivalent per month
Switched	3,285,029	120,186	trunks	$ 0.00023	per minute
Special	5,830,786	213,325	trunks		
Transmission Terminal	15,974,062	333,511	trunks	$ 3.99	per DS-0 equivalent per month
				$ 0.00040	per minute
				$ 0.00062	total per minute
Common					
Transport	$ 1,345,010	3,703,400,627	minutes	$ 0.00036	per minute per leg (orig or term)
Transmission Terminal	1,607,319	3,703,400,627	minutes	$ 0.00043	per minute
				$ 0.00079	total per minute
Direct					
Transport	$ 4,708,411	16,120,464,725	minutes	$ 0.00029	per minute
Transmission Terminal	7,051,747	16,120,464,725	minutes	$ 0.00044	per minute
				$ 0.00073	total per minute
Tandem switch	$ 1,817,867	3,322,868,975	minutes	$ 0.00055	per minute
Operator systems	$ 6,044,254				
Public Telephones	$ 4,825,844				
Total (w/ Public)	$ 656,201,536				
Total cost of switched network elements (w/o Public)	$ 17.02	per line/month			

HAI End office switching

Line Port	$	86,561,587	2,959,791	switched lines	$ 2.44	per line/month
Non-Line Port	$	57,707,724	62,141,633,323	DEMs	$ 0.0009286	per Dial Equipment Minute
Non-Line Port Adjustment for Billed MOUs=			1.044		$ 0.0009695	per Billed Minute

	Annual Cost	Units		Cost		
End office switching	$ 144,269,311					
Line Port	57,347,051	2,959,791	switched lines	$ 1.61	per line/month	
Non-Line Port	86,922,260	62,141,633,323	actual minutes	$ 0.00146	per actual minute	(Adjusted for Billable Minutes)
Signaling network elements	$ 2,865,199					
Links	192,604	507	links	$ 31.66	per link per month	
STP	2,234,461	41,094,682,805	TCAP+ISUP msgs	$ 0.00005	per signaling message	
SCP	438,134	2,118,313,400	TCAP queries	$ 0.00021	per query	
Transport network elements						
Dedicated						
Sw+Sp Transport	$ 9,115,815	333,511	trunks	$ 2.28	per DS-0 equivalent per month	
Switched	3,285,029	120,186	trunks	$ 0.00023	per minute	
Special	5,830,786	213,325	trunks			
Transmission Terminal	15,974,062	333,511	trunks	$ 3.99	per DS-0 equivalent per month	
				$ 0.00040	per minute	
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Tandem switch	$ 1,817,867	3,322,868,975	minutes	$ 0.00055	per minute	
Operator systems	$ 6,044,254					
Public Telephones	$ 4,825,844					
Total (w/ Public)	$ 656,201,536					
Total cost of switched network elements (w/o Public)	$ 17.02	per line/month				

	Annual Cost	Units		Cost		
End office switching	$ 144,269,311					
Line Port	86,561,587	2,959,791	switched lines	$ 4.06	per line/month	**100% Allocation to Port**
Non-Line Port	57,707,724	62,141,633,323	actual minutes	$ -	per actual minute	
Signaling network elements	$ 2,865,199					
Links	192,604	507	links	$ 31.66	per link per month	
STP	2,234,461	41,094,682,805	TCAP+ISUP msgs	$ 0.00005	per signaling message	
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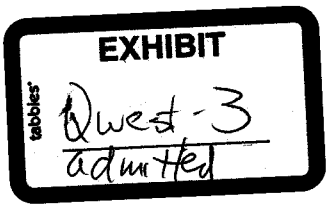
Tandem switch	$ 1,817,867	3,322,868,975	minutes	$ 0.00055	per minute	
Operator systems	$ 6,044,254					
Public Telephones	$ 4,825,844					
Total (w/ Public)	$ 656,201,536					
Total cost of switched network elements (w/o Public)	$ 17.02	per line/month				



BEFORE THE ARIZONA CORPORATION COMMISSION

MARC SPITZER
CHAIRMAN
JIM IRVIN
COMMISSIONER
WILLIAM A. MUNDELL
COMMISSIONER
MIKE GLEASON
COMMISSIONER
JEFF HATCH-MILLER
COMMISSIONER

IN THE MATTER OF INVESTIGATION INTO QWEST CORPORATION'S COMPLIANCE WITH CERTAIN WHOLESALE PRICING REQUIREMENTS FOR UNBUNDLED NETWORK ELEMENTS AND RESALE DISCOUNTS.	)))))))	DOCKET NO. T-00000A-00-0194 PHASE II AND PHASE IIA

REBUTTAL TESTIMONY OF

PHILIP LINSE

ON BEHALF OF QWEST CORPORATION

May 12, 2003

TESTIMONY INDEX

Page

I. IDENTIFICATION OF WITNESS

Q. PLEASE STATE YOUR NAME, OCCUPATION AND BUSINESS ADDRESS.

A. My name is Philip Linse. I am employed by Qwest Corporation ("Qwest") as a Director, Technical Regulatory in the Local Network Organization. My business address is 700 W. Mineral, Littleton, Colorado, 80120.

Q. BRIEFLY OUTLINE YOUR EDUCATIONAL AND EMPLOYMENT BACKGROUND.

A. I received a Bachelors degree in Criminology and Sociology from the University of Northern Iowa in 1994. I have been in the telephone communications industry since 1995. I began with CDI Telecommunications in the engineering department as an Outside Plant Engineer. In 1998, I accepted a position with Pacific Bell as a Loop Technology Planner with responsibility for analyzing network capacity and selecting loop technology to deploy for the Sierra/North region of California.

In 2000, I accepted a position with U S WEST as a manager, Outside Plant Tactical Planning. I soon accepted a promotion to a staff position in Technical Regulatory, Interconnection Planning for Qwest. In this

position, I developed network strategies for interconnection of unbundled Signaling System 7 ("SS7"), unbundled switching and switching-related products. In addition to my strategy responsibilities, I provided network evaluation of new technologies and represented the network organization in interconnection agreement negotiations as a subject matter expert. As a subject matter expert in switching and signaling, I have learned about the switching concepts of the network. I accomplished this through on-the-job training and internal training opportunities, including one-on-one training with central office technicians and switch engineers.

II. PURPOSE OF TESTINONY

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my testimony is to respond to switching issues raised in the direct testimony of AT&T/WorldCom witnesses, Joseph Gillan and Richard Chandler, and to demonstrate that switch usage affects both the design and the costs of a switch.

III. ENGINEERING OF SWITCHING CAPACITY IS USAGE BASED

Q. ON PAGE 20, LINE 5 THROUGH LINE 6 OF THE TESTIMONY OF JOSEPH GILLAN AND RICHARD CHANDLER, THEY CONTEND THAT QWEST'S SWITCHING COSTS ARE NOT USAGE-BASED. DO YOU AGREE?

A. No. There is clearly a relationship between some switching costs and usage, as reflected by the fact that switch vendors sell switch processors with different usage capacities at different prices. While the costs for some parts of the switch (e.g., line ports) are caused by the number of lines, costs for other parts of the switch (e.g., trunk ports and central processor) are caused by usage. The size of a switch and the ultimate cost of switching bears a direct relationship to the levels of usage by customers who use the switch; the trunking and processing components of switches are engineered based on usage requirements. In fact, at page 20, lines 7 and 8, Messrs. Gillan and Chandler admit that the cost of switching increases as capacity (i.e. usage) increases.

Q. HOW IS THE TERM "USAGE" DEFINED IN THE CONTEXT OF TELEPHONE ENGINEERING?

A. "Usage" has a specific meaning in the context of telecommunications networks. It refers to the length of time a call is in place over a period of

time. Telephone engineers rely on usage statistics and data to plan and design the network. The amount of anticipated usage determines the amount of trunking and switch central processor capacity an engineer will include in a network design or plan and, in turn, the amount of capital a company will invest to add to the network.

Q. HOW IS USAGE MEASURED?

A. Usage is measured as Centum Call Seconds ("CCS"), or one hundred call seconds. A line or trunk that is in use for one hour, or sixty minutes, is being used for 3600 seconds, or 36 hundred call seconds, or 36 CCS. As stated in Newton's Telecom Dictionary, "One hundred call seconds or one hundred seconds of telephone conversation. One hour of telephone traffic is equal to 36 CCS (60*60=3600/100=36) which is equal to one Erlang." Newton's Telecom Dictionary, Volume 17 February 2001 page 131.

Q. ON PAGES 17 AND 18 OF THEIR DIRECT TESTIMONY MESSRS. GILLAN AND CHANDLER ARGUE THAT SWITCHING CAPACITY IS LIMITED BY THE NUMBER OF ACCESS LINES. IS THIS TRUE?

A. No. While the number of access lines is a factor that must be considered in switch engineering, it is not the determining engineering factor. The Gillan and Chandler testimony confuses the total number of access lines and trunks served by a switch with the switch processing resource capacity needed to effectively operate the lines and trunks. Many other

factors, such as switch software features used by existing access lines, are also important in switch engineering. I am not aware of any industry or vendor engineering standard, principle, or practice that does not design and engineer switching processors, initially or under growth circumstances, based on usage, as expressed in terms of CCS. In addition, the number of trunks engineered in a switch directly relates to usage (CCS) requirements.

Q. ON PAGES 12 AND 13 OF THEIR DIRECT TESTIMONY, MESSRS. GILLAN AND CHANDLER STATE THAT THE SWITCH PROCESSING CAPACITY IS LIMITED BY TRAFFIC AND/OR CALL ATTEMPTS. HOW IS THIS ASSOCIATED WITH USAGE?

A. This statement actually confirms that switch designs and costs are determined in substantial part based on usage. Specifically, they acknowledge that "the control structure's capacity limit is therefore typically expressed in terms of busy-hour call attempt."[1] This is no different than stating that the control structure's capacity is defined by usage. Indeed, using the definition of usage set forth by Messrs. Gillan and Chandler at page 10, lines 3 through 5, of their testimony, the "busy-hour call attempt" is clearly a form of usage. As they acknowledge, this form of usage is a limiting factor of a switch.

[1] Joint Direct Testimony of Joseph Gillan and Richard Chandler, page 13 line 2 and 3

Messrs. Gillan and Chandler admit further that a switch's switch fabric "capacity limit is thus affected by traffic and is usually expressed in traffic terms, either Erlangs or CCS."[2] This also clearly falls under the definition of "usage" that they give on page 10 lines 6 and 7. Again, this demonstrates that usage is a limiting factor of a switch. As can be clearly deducted from their testimony, the capacity measurement of both switch fabric and the control structure is defined by Messrs. Gillan and Chandler as "usage".

Q. ON PAGES 14 THROUGH 16, GILLAN AND CHANDLER THEN CONTEND THAT SWITCH PROCESSING CAPACITY IS NOT A LIMITING FACTOR OF SWITCHING CAPACITY. WITH THE ADVANCES IN SWITCH PROCESSOR TECHNOLOGY, DOES USAGE STILL PLAY A ROLE IN THE DESIGN OF SWITCHES?

A. Yes. Although technology advances provide greater processor capacities, switch engineering and design is still based on the fundamentals of switch usage. Essentially, a switch is designed and engineered based on the central processor, the line peripherals and the trunk peripherals. The peripherals provide the line and trunk ports. As line and trunk demands increase, more peripherals are added to the switch to increase the number of lines and/or trunks served by the switch. This can happen during the

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[2] Joint Direct Testimony of Joseph Gillan and Richard Chandler, page 13 line 9 and 10

initial switch engineering process or at a later time. In either case, the switch central processing capacity must be increased to accommodate the additional *usage* the central processor will experience. The Gillan and Chandler testimony admits that "ILECs will obviously not install switches with maximum capacity in all wire centers."[3]

Q. HOW IS THE END USER RELEVANT TO SWITCH USAGE?

A. The individual switch usage of the end user using each line is highly relevant because the aggregate usage by end users ultimately determines how much central processing capacity must be purchased by Qwest and deployed for the use of customers. In other words, the amount of central processor capacity needed is a direct function of switch usage—it is not a direct function of the number of lines. Put another way, lines are relevant to the amount of switch processor capacity that is required, but usage is the overriding factor.

Q. ON PAGE 21, MESSRS. GILLAN AND CHANDLER CONTEND THAT SWITCHING COSTS DO NOT RISE WHEN USAGE INCREASES BUT, INSTEAD, THAT COSTS RISE WHEN THE NUMBER OF LINES INCREASES. IS THIS ASSERTION CORRECT?

A. No. If the usage per access line increases, the total usage can increase with no change in line quantities. For example, an increase in usage

[3] Joint Direct Testimony of Joseph Gillan and Richard Chandler, page 18 line 7 and 8

without any increase in the number of access lines can require a carrier to add equipment, such as trunk modules and line concentration modules. This occurs because much of the switch is engineered based on usage, not based on line quantities. A plain example of how usage can increase much faster than line growth is the phenomenal growth in dial-up Internet traffic in the past few years.

Q. HOW DOES DIAL-UP INTERNET TRAFFIC CREATE ADDITIONAL SWITCH USAGE?

A. From a network perspective, a dial-up Internet call has the same appearance as a voice call. However, there is a critical difference. It is commonly recognized in the telecommunications industry that the average duration, or hold time, of a voice call is about three minutes, while the average hold time of a dial-up Internet call is 20 to 30 minutes or more[4]. Many of these calls last for multiple hours and sometimes even for days. When a customer initiates and connects such a call to its Internet Service Provider (ISP), the local switch must be used to make sure that the call is routed to the ISP (sometimes more than one switch is involved). During the entire duration of the call, some of the capacity of the switch continues to be used. Thus, dial-up Internet traffic has caused substantial increases in network usage. This increased usage has led to the need for Qwest to

[4] Impacts of Internet Traffic on LEC Networks and Switching Systems , AmirAtai,Ph.D., James Gordon, Ph.D., Telcordia Technologies, RedBank, Newjersey, June 1996; Architectural Solutions to Internet Congestion Based on SS7 and Intelligent Network Capabilities, A Telcordia Technologies Perspective by Dr. James

increase the capacity of the Arizona network, including its switching central processor capacity. In light of that, Messrs. Gillan's and Chandler's proposal for a flat-rated approach to usage-based switching is illogical; it simply fails to account for the relationship between usage and switching costs.

Q. HOW HAS THE INCREASED USAGE RESULTING FROM DIAL-UP INTERNET CALLS CAUSED QWEST TO INCREASE ITS NETWORK CAPACITY?

A. The increased usage caused by dial-up Internet traffic has required Qwest to make significant additions to its network in Arizona, both in trunking and central processor capacity, to switch the increased load. These additions are needed because as long as a dedicated path is held up, the switch is performing functions to make sure the call stays up until the customer requests a disconnect by ending the call.

Q. IF THESE TYPES OF USAGE REQUIREMENTS WERE NOT PLACED ON THE NETWORK, WOULD THE VENDOR ENGINEERING COSTS ON A PER LINE BASIS BE LOWER?

A. Yes, they would. Switch usage is considered by all switch vendor engineers when they engineer the central processing capacity needed, not only for the number of access lines assigned to the switch, but also for the

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Gordon; The Internet & the Public Switched Telephone Network – A troubled Marriage, Edward E. Cohen,

switching resources available to these access lines. In fact, as noted in Teresa Million's testimony, Qwest pays switch vendors a higher rate when higher CCS requirements exist in any given switch.

To use Messrs. Gillan's and Chandler's reference to personal computers[5], the switch can be viewed as a large computer. The lines and trunks can be analogized to peripheral equipment, such as printers, floppy and CD drives, and the terminal screen. In both cases, the number of lines and trunks and the number of peripherals attached are relevant to capacity, but they are not determinative. The number of peripheral devices connected to a computer does not dictate the need to upgrade the computer; similarly, the number of lines and trunks connected to a switch does not dictate the need to increase the switch's central processing capacity.

In both cases, the determinative factor leading to the need to upgrade the computer or the switch is the increased demand (i.e. usage) on the capacity of the central processor. The need to increase central processor capacity arises not from the number of lines connected to the switch, but from the amount of *usage* customers are pumping through the lines.

Albert A. Fredericks, Charles D Pack,1997
[5] Joint Direct Testimony of Joseph Gillan and Richard Chandler, page 14 line 11

Under the proposal of Messrs. Gillan and Chandler, the CLECs would have every incentive to increase usage. This would impose significant additional switching costs on Qwest which, under a flat-rated switching scheme, Qwest would not be able to recover.

IV. CONCLUSION

Q. DOES THIS CONCLUDE YOUR TESTIMONY.

A. Yes it does.

BEFORE THE ARIZONA CORPORATION COMMISSION

MARC SPITZER
CHAIRMAN
JIM IRVIN
COMMISSIONER
WILLIAM A. MUNDELL
COMMISSIONER
MIKE GLEASON
COMMISSIONER
JEFF HATCH-MILLER
COMMISSIONER

IN THE MATTER OF INVESTIGATION INTO QWEST CORPORATION'S COMPLIANCE WITH CERTAIN WHOLESALE PRICING REQUIREMENTS FOR UNBUNDLED NETWORK ELEMENTS AND RESALE DISCOUNTS.	)	DOCKET NO. T-00000A-00-0194 PHASE II AND PHASE IIA AFFIDAVIT OF PHILIP A. LINSE
STATE OF COLORADO	:	SS
COUNTY OF ARAPAHOE	)	

Philip A. Linse, of lawful age being first duly sworn, deposes and states:

1. My name is Philip A. Linse. I am Director, Technical Regulatory in the Local Network Organization of Qwest Corporation in Denver, CO.

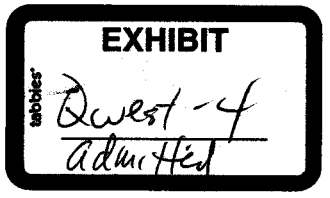
2. I hereby swear and affirm that my answers contained in the attached testimony to the questions therein propounded are true and correct to the best of my knowledge and belief.

Philip A. Linse

SUBSCRIBED AND SWORN to before me this 12 day of May, 2003.

Cynthia M Stage
Notary Public

My Commission Expires:
4-10-04



BEFORE THE ARIZONA CORPORATION COMMISSION

COMMISSIONERS

MARC SPITZER
Chairman
JAMES M. IRVIN
Commissioner
WILLIAM A. MUNDELL
Commissioner
JEFF HATCH-MILLER
Commissioner
MIKE GLEASON
Commissioner

IN THE MATTER OF INVESTIGATION INTO QWEST CORPORATION'S COMPLIANCE WITH CERTAIN WHOLESALE PRICING REQUIREMENTS FOR UNBUNDLED NETWORK ELEMENTS AND RESALE DISCOUNTS	DOCKET NO. T-00000A-00-0194 PHASE IIA

STIPULATION OF AT&T, MCI AND QWEST

AT&T Communications, WorldCom, Inc., and Qwest Corporation stipulate and agree to the following stipulated fact and request that the Commission accept this fact as true and correct:

> AT&T, WorldCom, and Qwest stipulate and agree that lowering transport rates below the rates produced by the HAI model in Phase II of this Docket causes the HAI model to increase the amount of expenses assigned to the unbundled loop and switching elements.

Respectfully submitted this 28th day of May, 2003.

Respectfully submitted,

Qwest Corporation

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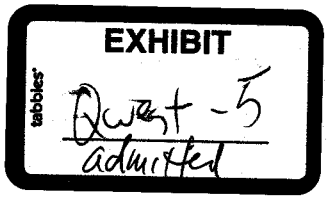

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IN THE MATTER OF INVESTIGATION INTO U S WEST COMMUNICATIONS, INC.'S COMPLIANCE WITH CERTAIN WHOLESALE PRICING REQUIREMENTS FOR UNBUNDLED NETWORK ELEMENTS AND RESALE DISCOUNTS	**DOCKET NO. T-00000A-00-0194** **Phase IIA**

AT&T/MCI RESPONSES
TO QWEST CORPORATION'S
SECOND SET OF DATA REQUESTS

AT&T Communications of the Mountain States, Inc. ("AT&T") and MCI WorldCom Network Services, Inc. ("MCI") hereby submit responses to Qwest's Second Data Requests.

GENERAL OBJECTIONS

1. AT&T and MCI object to the definition of the terms "CLECs", "you", "your", "AT&T Communication of the Mountain States, Inc.", and "MCI WorldCom Network Services, Inc." as requiring a response beyond the requirements of the procedural rules governing this proceeding.

2. AT&T and MCI object to these data requests to the extent that they require supplementation beyond the requirements of the procedural rules governing this proceeding.

3. These general objections are incorporated into each response below. In addition, AT&T and MCI will state specific objections where applicable.

AT&T/MCI RESPONSE TO
QWEST CORPORATION'S
SECOND SET OF DATA REQUESTS
ACC Docket NO. T-00000A-00-0194, Phase IIA

DATA REQUEST NO. 1:

Please identify the percentage of switching costs that AT&T/MCI believes should be assigned to the UNE port switching element and the percentage that should be assigned to the non-UNE port switch element. Please explain why you support this assignment of switching costs, and produce any documents or data that you are relying on to support your position on this issue.

RESPONSE TO DATA REQUEST NO. 1:

AT&T and MCI believe that 100% of the switching costs should be assigned to the non-usage based switching element and 0% to the usage based switching element. Please see the Joint Direct Testimony of Joseph Gillan and Richard Chandler, filed on April 28, 2003 in this docket, for support for this position.

AT&T/MCI RESPONSE TO
QWEST CORPORATION'S
SECOND SET OF DATA REQUESTS
ACC Docket NO. T-00000A-00-0194, Phase IIA

DATA REQUEST NO. 2:

Please provide copies of any runs of the version of the HAI model presented in Phase IIA that (1) assign switching costs consistent with the percentages identified in response to Request No. 1, and (2) use the inputs from the Commission's ruling relating to switching in the Phase IIA order issued December 13, 2002 ("Phase IIA Order").

RESPONSE TO DATA REQUEST NO. 2:

AT&T and MCI object to this data request to the extent that it seeks attorney-client and work product privileged documents and communications. Subject to, and without waiver of, those objections, please see electronic attachment A-2 (HAI Results – flat rated switching).xls.

DATA REQUEST NO. 3:

Please provide copies of any runs of the HAI model that AT&T/MCI performed to implement the Commission's rulings related to switching in the Phase IIA Order, including runs performed in connection with the parties' joint preparation of the pricing compliance list.

RESPONSE TO DATA REQUEST NO. 3:

AT&T and MCI object to this Data Request on the grounds that it improperly seeks attorney-client and work product privileged documents, is unduly burdensome and expensive, and is not reasonably calculated to lead to the discovery of admissible evidence. Subject to, and without waiver of, these objections, attachment A-3 (HAI Results – Phase IIa).xls contains the results agreed upon by AT&T and Qwest representatives reflecting the Commission's input determinations in Phase IIA of the case.

DATA REQUEST NO. 4:

Please produce all documents in AT&T's/MCI's possession that refer or relate to the switching rates produced by the HAI model using the inputs from the Phase IIA Order, including any notes, memoranda, e-mails, and correspondence.

RESPONSE TO DATA REQUEST NO. 4:

AT&T and MCI object to this Data Request on the grounds that it improperly seeks attorney-client and work product privileged documents, is unduly burdensome and expensive, and is not reasonably calculated to lead to the discovery of admissible evidence. Subject to, and without waiver of, these objections, please see response to Data Requests Numbers 2 and 3.

AT&T/MCI RESPONSE TO
QWEST CORPORATION'S
SECOND SET OF DATA REQUESTS
ACC Docket NO. T-00000A-00-0194, Phase IIA

DATA REQUEST NO. 5:

Please state whether AT&T/MCI agrees that running the version of the HAI model presented in Phase IIA with the switching inputs from the Phase IIA Order produces a port rate of $2.44 and a per minute of use rate of $0.00093. Please state further whether AT&T/MCI agrees that after accounting for the ruling in the Phase IIA Order relating to the use of "billable minutes" instead of "dial equipment minutes" (Phase IIA Order at 20), the per minute use rate of $0.00093 produced by HAI increases to $0.00097. If you do not agree that the model produces these rates, please list the rates you believe the model does produce based on the Phase IIA inputs and produce any runs of the model that support your position.

RESPONSE TO DATA REQUEST NO. 5:

AT&T and MCI agree that running the version of the HAI model presented in Phase IIA with the switching inputs from the Phase IIA Order produces a port rate of $2.44 and a per minute of use rate of $0.00093. AT&T and MCI further agree that after accounting for the ruling in the Phase IIA Order relating to the use of "billable minutes" instead of "dial equipment minutes" (Phase IIA Order at 20), the per minute use rate of $0.00093 produced by HAI increases to $0.00097.

DATA REQUEST NO. 6:

Please state whether AT&T/MCI agrees that if all switching costs were assigned to the switch port, the version of the HAI model presented in the Phase IIA would produce a monthly recurring port rate of $4.06 using the switching inputs from the Phase IIA Order. If you do not agree that the model produces this rate when all switching costs are assigned to the port, please list the rate you believe the model does produce based on the Phase IIA inputs and produce any runs of the model that support your position.

RESPONSE TO DATA REQUEST NO. 6:

AT&T and MCI agree that if all switching costs were assigned to the switch port, the version of the HAI model presented in the Phase IIA would produce a monthly recurring port rate of $4.06 using the switching inputs from the Phase IIA Order.

DATA REQUEST NO. 7:

Please provide all density summary reports generated from your runs of the HAI model using the switching inputs from the Phase IIA Order.

RESPONSE TO DATA REQUEST NO. 7:

AT&T and MCI object to this Data Request on the grounds that it improperly seeks attorney-client and work product privileged documents, is vague and ambiguous, is unduly burdensome and expensive, and is not reasonably calculated to lead to the discovery of admissible evidence. Subject to, and without waiver of, these objections, see responses to Data Requests Nos. 2 and 3.

DATA REQUEST NO. 8:

Please provide copies of all runs of the HAI switching module that AT&T/MCI generated in preparing for and participating in the Phase IIA proceeding, including all runs of the model that produce the switching rate AT&T/MCI proposed in the Phase IIA hearing.

RESPONSE TO DATA REQUEST NO. 8:

AT&T and MCI object to this Data Request on the grounds that it improperly seeks attorney-client and work product privileged documents, is unduly burdensome and expensive, and is not reasonably calculated to lead to the discovery of admissible evidence. Subject to, and without waiver of, these objections, please see attachment A-3 (HAI Results – IIa proposed).xls which contains a copy of the HAI Model results that AT&T proposed in phases II and IIA of this case.

The Internet & The Public Switched Telephone Network – A Troubled Marriage

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Abstract: Internet access traffic continues to increase dramatically on the Public Switched Telephone Network (PSTN) in the United States and has changed the fundamental nature of traffic and customer service. Call blocking has surged in much of the network (overall average blocking reaching 5% and more than 30% of the groups exceeding 3% blocking in some areas), and instances of extremely high blocking persist. Customer complaints are increasing, and Local Exchange Carriers (LECs) are placing a high priority on "fixing the Internet problem." In selected areas, interoffice trunks increased 44% in the period June 1995 to June 1996, with high blocking remaining as a serious issue. This report describes the typical problems and preliminary findings, which identify the mechanics for the seemingly unfixable high blocking. Based on this work, being directed by Bellcore, LECs are developing new strategies for carrying this new kind of traffic.

1 INTRODUCTION

The phenomenal growth of Internet access traffic on the Public Switched Telephone Network (PSTN) has increased both revenues and expenses for Local Exchange Carriers (LECs). Residences with additional residential lines surpassed 14 percent in 1996, up from 8 percent in 1993 [1]; approximately twenty-one percent of customers can dialup the Internet from their home [2]. However, customers are experiencing incomplete calls at new times of the day and at record levels. In their persistence to complete calls in an evening hour, customers sometimes make more re-attempts, in the aggregate, than successful call completions. It is no surprise that, in selected areas, interoffice trunks increased 44 percent in the period June 1995 to June 1996, compared to nine percent traditional growth. For nine central offices, the number of interoffice trunks in service increased 44 percent from June 1995 to June 1996 (total 16,585 trunks). This growth yielded an additional investment of $17.8 million for interoffice trunks among these nine offices[3].

In this paper, we first provide background on how customers access the Internet through the PSTN; we then indicate how the Internet "call" properties are changing our understanding of "telephone network" traffic. Based on a large body of measurements and statistics (described in Section 2), and backed by computer simulation, we make these conclusions about traffic today on the PSTN:

- The existence of at least two very different categories for average holding time (moderate for POTS and very long for Internet) dramatically affects all measurement accuracy, including estimates of average loads and call blocking.[a]
- In addition, preliminary evidence suggests that these two populations may also see different levels of blocking within the overall average. At times, POTS traffic may see higher blocking than the Internet traffic on the same trunk group (over the same period).
- A strong correlation, sometimes negative and sometimes positive, exists between call blocking on the PSTN and the modem blocking of an Internet Service Provider (ISP). The specific level of correlation depends on the reattempt behaviors of the customers. At times, high call blocking on the PSTN will "mask" (that is, temporarily reduce the realized) modem blocking and vice versa. However, under appropriate conditions, these blocking levels can be positively correlated (move in the same direction) with the extended peaks and tail of the blocking distribution.[b]
- It follows that the network capacity requirements of the PSTN (determined by the LEC) and the modem pool (determined by the ISPs) are dependent. When both the PSTN and the modem pool are under-engineered, the performance of the LEC and ISP networks is most intensely linked.

2 SOURCES OF DATA

The statistics and graphs in this report rely on three sources of data. The SS7 measurements provided the call history of more than twenty million individual carried calls collected from transactions on the Common Channel Signaling Network (CCSN). The traffic included calls from 45 end office switches (called ingress offices) to four other end offices (called egress switches), where callers could access 37 ISPs. Using the originating and dialed number, we aggregated and analyzed all these calls by ISP or non-ISP destination. Secondly, using reports from a trunk engineering system, we matched statistical summaries of the SS7 call measurements with the corresponding offered traffic and call blocking on the trunk groups. While the measurements from the CCSN yielded detailed statistics in every hour, these trunk-group statistics only gave average values over a twenty-day period in the busy hour. The third source of data was a call-by-call simulation, which modeled the traffic flows of POTS and Internet traffic from their originating offices to the POTS or Internet (ISP) destinations. The SS7 and PSTN measurement collections provided the statistical distributions for the arrival processes, holding times and other parameters in the simulation. Figure 1 will later describe a snapshot of this simulation.

3 WHAT IS CHANGED: THE PSTN WITH INTERNET ACCESS

The changes in both PSTN and ISP traffic and the consequences for quality of service, capital investment and rate of return have evolved since the rapid increase in dialup access to the Internet. We follow these changes and highlight the properties of this new traffic. This material serves as a springboard for explaining completed work that has identified important dynamic relationships among Internet traffic, customer behavior and the engineering of the PSTN and ISP networks. These latter three topics will be covered in greater depth in Sections 4, 5 and 6. With the growth of Internet access traffic on the PSTN, both the LECs and the ISPs manage a portion of the switched network from the customer to the collection of fast packet networks known as the Internet. For the duration of a call, the LEC dedicates to an Internet caller assigned trunks and lines from his/her ingress to egress offices. From the egress office, the call is carried on a line to a modem (pool) managed by the ISP. The ISP routes this traffic from each modem (dedicated to a caller for the duration of the call) to a concentrator where the calls of many customers are carried using packet technology to the Internet. Figure 1 illustrates the common PSTN and ISP facilities that carry POTS and Internet traffic.

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[a] *Plain Old Telephone Service (POTS)* refers to Message Telephone Service offered over a two-wire analog customer loop.

[b] The *tail* of a probability distribution for blocking refers to blocking values that differ significantly from the mean, e.g., blocking values exceeding some threshold. The importance of long-tailed distributions for blocking and for call holding time will be discussed in this paper.

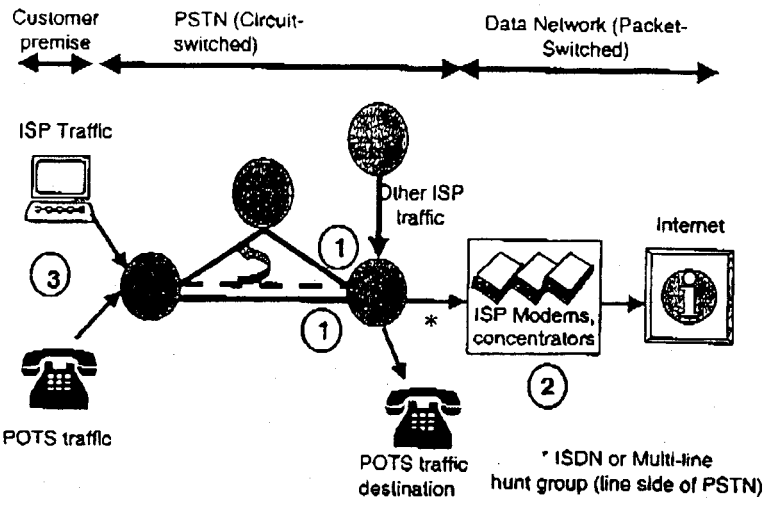

Figure 1 Both the LECs and the ISPs manage a portion of the network that carries traffic to the Internet. The text below explains the circled numbers, which highlight discussion points in the architecture of the PSTN and the ISP access network.

Figure 1 shows several areas in the PSTN where traffic is treated differently today:

- (1) POTS and Internet calls vie for the same (common) trunk groups and switches managed by the LEC. Also, Internet access to a group of ISP modems is shared among one or more LEC trunk groups, delivering Internet traffic to the ISP.
- Assuming adequate switch capacity, a customer can encounter two points where he/she may experience busy facilities and be blocked from completing the call: (1) All trunks are busy on a trunk group in the path from the ingress office to an egress office, and (2) all modems are busy in an ISP modem pool.
- (3) Customers who are blocked at either point in the network might reattempt new calls.

We review several known properties of Internet traffic carried on the PSTN that we also observed from our measurement collections. Atai and Gordon have described other properties, including the possible fractal nature of PSTN traffic [4]:

- Customers may experience high call "blocking" from all busy trunks or all busy modems.
- Many Internet (and other) callers persistently reattempt when they are "blocked".
- Internet calls are about eight to ten times the average duration of POTS calls.

With data collected on 59 direct final trunk groups in three metropolitan areas over 20 business days, the average holding time was 30 minutes for Internet calls (33 minutes standard deviation) while the POTS calls lasted 5 minutes on the average. Calls to ISPs, including customer redials, comprised about 11 percent of the total carried calls. Although the average blocking objective on these trunk groups was one percent, the overall average measured blocking was 5 percent (14 percent standard deviation). In addition, 32 percent of these trunk groups had blocking in excess of 3%. Assuming Neal-Wilkinson trunk engineering[c], this level of realized blocking contrasts with a theoretical probability that only one

[c] Neal-Wilkinson engineering is a procedure that quantitatively relates traffic parameters in a system in which calls encountering all busy trunks (servers) are cleared from the system. It relates these quantities: a busy-hour offered

percent of trunk groups with this blocking objective will exceed about 3 percent blocking when the groups are properly engineered.

During each of several hourly intervals, individual customers redialed as many as 100 times when they were blocked because all modems were busy. The sample included calls to 21 ISPs on a Monday from 10 to 11 p.m. From this sample, 3,156 customers made a total 27,114 reattempts. Among these customers, 1,368 callers made 9,644 retries without any success. (They gave up.)

The distribution of holding times for Internet calls has a long tail and a correspondingly large variance. The next section will show that this long tail is partly responsible for the instability of blocking on the PSTN. Many of the calls in the distribution typically are short. For example, we studied one direct final trunk group with 32 percent blocking from 9 to 10 p.m. Of nearly 2,000 carried calls, 69 percent of these calls lasted under two seconds and represented customers who redialed when they encountered a busy modem. Section 5 will elaborate on how retrial behaviors can create unstable blocking.

4 LONG HOLDING TIME

Computer simulation and preliminary theoretical analysis suggest that mixed traffic with the properties discussed in Section 3 could create conditions that are new, or at least unusual, in the PSTN. This section describes two of these new conditions:

- Statistics describing the measurements associated with this mixture of long and moderate holding time calls take many hours to stabilize.
- The average call-blocking rate for the two populations of traffic on the PSTN could differ. That is, even if the overall average blocking meets objectives, each population (parcel) average may not. Certainly, at times, the POTS traffic may see worse blocking than the overall average.

4.1 Transient Measurement Statistics

For traffic with long holding times or a long-tailed distribution of holding times, several hours of observations may be required until estimates of parameters approach their true equilibrium (mean) values. Before the introduction of Internet traffic onto the PSTN, most observations reached a steady state well within an hour of real time. Based on this historical experience, traffic engineers for the PSTN based their network decisions on measurements spanning a one-hour interval. However, new computer simulations showed that even after 12 hours, several important statistics failed to reach their true long-run values. Figure 2 tracks the offered load,[d] mean call holding time and call blocking on a PSTN trunk group and at an ISP modem pool. In this example, the PSTN has too few trunks and the ISP has too few modems for each to support a typical average blocking objective of one percent. Each data point for the offered load and mean holding time (top two curves in Figure 2) represents a cumulative count of a measured value from the beginning (at zero hours) divided by the value input to the simulation. Only original attempts (not redials) by callers are counted. Therefore, these two plotted lines should approach 100 percent as the observed value reaches its true value. The data points for the blocking (bottom two curves in Figure 2) are not "normalized" but are simply given as a percent because blocking was not an input to the simulation. The blocking on the trunk group is the number of blocked attempts because all trunks were busy, divided by the total call attempts.

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load and peakedness, the day-to day variance of traffic offered over about 20 business days, trunk blocking and trunks in service.

[d] The offered load is defined as the expected number of busy trunks on a trunk group that has an infinite number of trunks (for single populations, this is usually stated as the average call arrival rate times the average holding time). The blocking at the modems is the number of blocked attempts at the modems divided by the total call attempts.

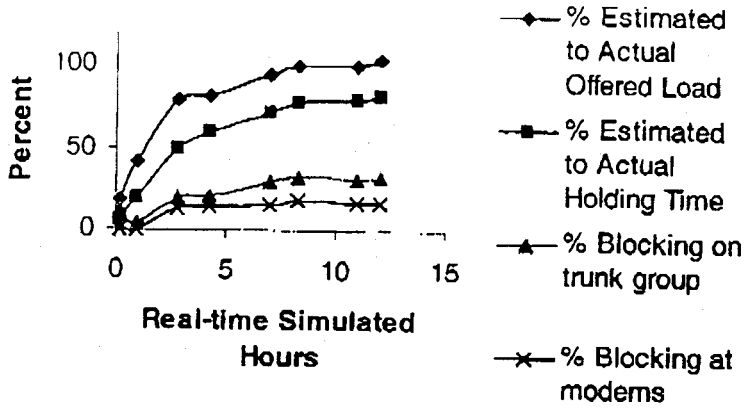

Figure 2 In this computer simulation of mixed POTS and Internet traffic, the time for an observed value of offered load to reach or exceed its true value (at 100 percent on the graph) required about 12 hours (top curve). However, the observed holding time fell far short of its true value even after 12 hours (second curve). For comparison, the graph also tracks the percent blocking on the PSTN trunk group and the ISP modems (third and fourth curve).

4.2 Parcel Blocking

Service objectives for the PSTN are usually defined for the *overall* average level of blocking on a trunk group in the normal busy hour(s). The total traffic often is comprised of smaller populations, called parcels, which have distinguishing characteristics, such as holding time, offered load or peakedness. Peakedness is a statistic that quantifies the burstiness of the offered traffic over one hour.[c] The average level of call blocking, for each parcel, depends on the offered load, peakedness, group size, daily arrival patterns and other characteristics of all parcels of traffic. We will provide brief background on peakedness, then show why both peakedness and the holding time strongly affect the different realized blocking levels for the POTS and Internet traffic parcels.

In a network such as the PSTN with alternate routing, the peakedness of offered traffic changes as it switches from one trunk group to another and seeks an available path. Traffic that is carried on its first-choice trunk group often can be modeled by a Poisson arrival process, for which the peakedness of offered traffic has a value of one. If calls are routed to a trunk group that has all trunks busy, it may be alternate-routed to a different trunk group. The peakedness of this overflow always exceeds one, since the traffic is "burstier" (that is, the traffic only overflows during short periods when the subtending groups are busy). Commonly used techniques in traffic engineering have generally assumed that the offered loads and peakedness of the traffic parcels determine the respective parcel blockings on a given trunk group. Higher peakedness for a parcel meant higher overall blocking. Therefore, using classical theory, when POTS and Internet calls were mixed on the same trunk groups, the parcel with the higher peakedness (usually Internet traffic) might have been expected to see a higher blocking level, even while the overall average blocking met the design objective. However, our recent studies indicate that, in addition to peakedness, average holding time may also play an important role in determining parcel blocking on a shared trunk group. Specifically, under conditions explained next, the POTS parcel might see worse blocking than the Internet parcel even if they have same level of peakedness!

New theoretical analysis [5], confirmed by computer simulation, shows that the holding time distribution of a parcel also plays a critical role in the blocking rate for each parcel. In particular, for the same levels of POTS and Internet offered loads and peakedness, the POTS traffic (with the shorter

[c] The *variance* of the offered traffic is defined as the variance of the number of busy trunks on a trunk group with an unlimited number of trunks. The *peakedness* is the ratio of this variance to the mean of the offered load.

average holding time) might see higher expected blocking than the Internet traffic. Other factors could create entirely different patterns of blocking in a network setting in which the POTS callers could experience the higher blocking. In Section 6, we will discuss how the rate of call blocking on the PSTN depends on the engineering or availability of the ISP modem pool.

5 BUSY MODEM and BUSY TRUNK RETRIES

Analysis of SS7 measurements, supplemented by computer simulation, showed a strong linkage between high PSTN blocking and the human or machine behavior to try again. When a person or computer dials and receives a response that their call did not connect, they could abandon further attempts. More often, they try again using a manual or automated process. They are unconcerned whether they received a fast busy (because all PSTN trunks were busy) or a slow busy signal (because the called person or machine was busy). This propensity of the customers to complete their calls will help explain in Section 6 why LEC and ISP engineering are mutually dependent. The distribution of the time that a customer waits to redial after a modem-busy or trunk-busy, called the inter-arrival distribution, is distinctly different for POTS and Internet calls.[f]

5.1 Distinct Retry Behaviors

The SS7 measurement collection yielded a clear difference in retrial behavior for POTS and Internet callers. Each group differed in their interval between re-attempts and their persistence when blocked.

We stratified the measurements by ISP and non-ISP callers. Using the automated-redial feature in their computers, the ISP (Internet) group retried at the default interval of 30 seconds (after a failed attempt), as set by the manufacturer in most computers. Callers to ISPs accessing the Internet retried at 32.5 seconds with negligible variance. The time to set up trunk groups to the ISPs accounts for the 2.5-second delay beyond the default redial rate. In contrast, POTS callers dialing a non-ISP retried at nearly 39 seconds on the average with a standard deviation of several seconds.

Furthermore, we found that Internet callers who received a slow or fast busy redialed on the average 75 to 80 percent of the time. However, the POTS callers who received a slow or fast busy redialed on the average about 60 percent of the time. We conclude that the Internet callers have the higher retry rate.

5.2 Correlation of Busy Modems with High Blocking

From computer simulations driven by statistics from our measurement collections, we will show that several conditions influence blocking on the PSTN and at the modems. In the long-term, the blocking on individual trunk groups could level off, decline to zero or even approach complete blocking. Over short intervals, say several minutes, the blocking could be quite volatile. We will consider these kinds of conditions:

- increasing peakedness of the offered traffic
- increasing the time between an Internet customer's retry attempts, or increasing the persistence of these customers to redial
- the effects of multiple trunk groups served by a common modem pool
- the dependence of traffic engineering on the LEC and ISP networks (discussion is delayed until Section 6)

When *peaked traffic* from the PSTN is offered to a modem pool, the blocking on PSTN trunk groups and at the modems may both increase. For example, based on the outcome of simulation runs

[f] In our studies, we counted a customer reattempt (also called a redial) as the number of times a subscriber repeatedly dialed the same number within an hour. The SS7 measurements provided the called number.

summarized by the top curve in Figure 3, blocking increases continuously at the modems as peakedness increases.

When modem blocking is significant, it is also possible that the corresponding blocking on the PSTN-access portion of the network could level off or even decline. (Refer to the middle and bottom curves of Figure 3.) The reason is that the blocking at the modem pool reduces the usage (carried traffic) on the access trunk groups. The persistent users who are blocked at the ISP (carried on the PSTN) and retry *quickly* will again get through the trunk network and still be "blocked" by the modems. Eventually, the caller stops trying (when the retry probability is less than 1) and "defects". This effect is due to high correlation of arrivals.

The "opposite" effect may also happen when this correlation is diminished. That is, high call blocking at the modems could decline while blocking on the PSTN could approach 100 percent when *retrials are spaced over longer periods of time* (or if the *retrial rates approach 100 percent*). This is because, at some point, the caller is less likely to see the congestion conditions as before. He / she may either (1) be blocked by trunks or modems that were previously idle or (2) gain access to the LEC and ISP networks long after his/her first call attempt. In essence, the customers are delaying their offered load (and potential blocking) to a later interval where new first-attempt calls are also made. This delay can create "pileups" of deferred demand, an artificially created "peakedness".

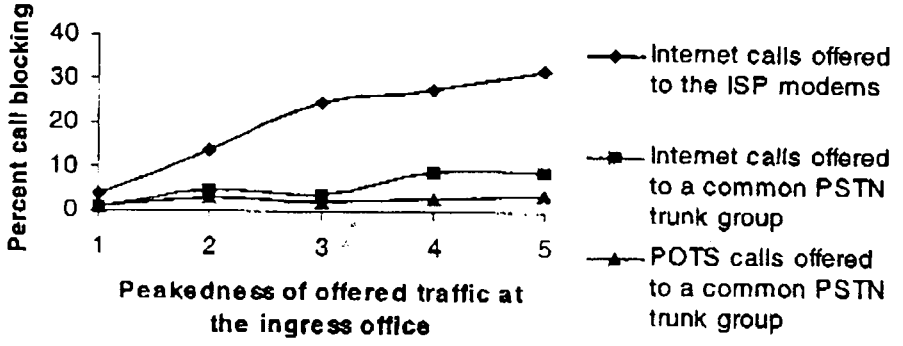

Figure 3: These results of simulation show how variability of traffic offered to the ISP modem pool will increase blocking on the PSTN trunk groups. The blocking rates are shown after 16 hours of real time.

The blocking on *multiple trunk groups* that terminate at an egress office (where an ISP is) can experience volatile blocking. Calls that are carried on these trunk groups share access to a common modem pool. As the callers on one trunk group seize or relinquish the modems in this common pool, they essentially change the number of modems available for callers on the various individual trunk groups. Hence, customers accessing the network from different geographic areas may see significantly different blockings unless reservation or priority schemes are employed.

6 DEPENDENCE BETWEEN LEC AND ISP NETWORK ENGINEERING

The engineering of PSTN trunk groups and the ISP modems strongly influence the blocking on *both* networks. Section 5.2 has just explained that an increase in the volatility of traffic or caller persistence can foster this same kind of dependence. The most desirable state, (but not perfect one) occurs when both carriers meet their service objectives (See Section 6.1). If one carrier under-engineers its network, the blocking on the other's well-engineered network can also degrade slightly or moderately (Section

6.2).[8] When both networks are under-engineered, the blocking on either network can seemingly move in any direction (Section 6.3). In fact, this may be a significant cause of the observed instability of capacity requirements commonly seen on the PSTN. That is, with no other changes in the network or demand patterns, PSTN *capacity requirements may increase* as the ISP *capacity is added!* However, if the PSTN was already "properly engineered," PSTN capacity requirements may be unchanged or drop slightly as ISP-stimulated retries also diminish.

Based on material in this section and the above discussion, we will conclude that:

- When either the LEC or ISP facilities (not both) are under-engineered, the blocking on each carrier's network increases slightly or moderately.
- When both the LEC and ISP facilities are under-engineered, the blocking on both networks can be difficult to predict.

6.1 When the ISP is well-engineered

When both the LEC and the ISPs have well-engineered networks, the POTS and Internet traffic on the LEC network are nearly independent of conditions on the ISP network. However, the downside effects of long holding time traffic, with respect to traffic and measurement volatility, are still present. Because of the volatile nature of Internet traffic, several key parameters of interest, including blocking, might be slow to converge to their steady-state values. Section 4.1 showed that the long tail of the distribution for holding time is partly responsible.

6.2 When the LEC or the ISP is not well-engineered

When only one of the LEC and ISP networks is well-engineered, the POTS and Internet traffic could incur still higher blocking. In addition to the downside effects summarized in Section 6.1, the volatility of the Internet traffic described in Section 5.2 will exacerbate the retrial behavior of customers and the PSTN blocking. Furthermore, if customers respond to the busy modems by increasing their redial rate, they could drive the blocking on trunk groups still higher. Analysis of the SS7 measurements, explained in Section 5.1, showed that Internet customers increase their likelihood of redialing when the average call holding time of network calls increases.

6.3 When both the LEC and ISP are under-engineered

When both the LEC and ISP have under-engineered their networks, a very strong dependence occurs between the traffic on the two networks. Unfortunately, as shown in Sections 5 and 6 above, the impact on PSTN blocking is somewhat unpredictable unless measurements (or similar qualitative information) on both networks are used in the engineering processes. Together with the problems outlined in Sections 6.1 and 6.2, the transience of the measured network quantities becomes excessive. Figure 2 showed that, in some cases, the average holding time and the trunk group blocking do not approach their true values even after 12 real-time hours.

At least two conditions can promote increased blocking on the PSTN. As shown in Section 5.2, even without the presence of Internet traffic, peakedness of offered traffic promotes higher blocking. In addition, Section 5.2 explained that blocking could increase further as the volatile traffic carried on different trunk groups attempts to seize the shared pool of ISP modems.

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[8] We define *well-engineered* as a level of facilities that maintains a defined quality of service essentially independent of the capacity of the "other carrier". Under-engineering of either the LEC or ISP networks to meet current demand could be due to the rapid growth of Internet traffic that is often out-stripping the abilities of LECs and ISPs to install new facilities ahead of that demand.

Furthermore, the under-sizing of each network creates a high dependence between the number of busy ISP modems and busy LEC trunks. Modem blocking and trunk blocking can move in the opposite directions as the size of the ISP modem pool increases. That is, when the ISPs increase the number of modems, the LEC network could see a surge in trunk usage. Meanwhile, the customer might always see high blocking while either the LEC or ISP observe low blocking.

Figure 4 helps illustrate this counter-intuitive occurrence. Using computer simulation, different levels of offered traffic for POTS and Internet calls with peaked traffic (peakedness exceeding one) were routed on a fairly complex network, similar to the one shown in Figure 1. In this simulated network, the PSTN trunk groups and the ISP modem pool were purposely under-sized relative to the service objective of one- percent average call blocking. When the ISP modem pool is undersized (left part of Figure 4), the Internet customers can find an available trunk (represented by the lower curve) but are blocked by the under-engineered modem pool (seen by the middle curve). After the ISP has added modems (right part of Figure 4), the Internet customer is blocked on the under-sized PSTN trunk groups and never reaches a modem. From the viewpoint of the Internet customers (top curve), they see high blocking when either or both of the PSTN trunk-groups and ISP modem pools are under-engineered .

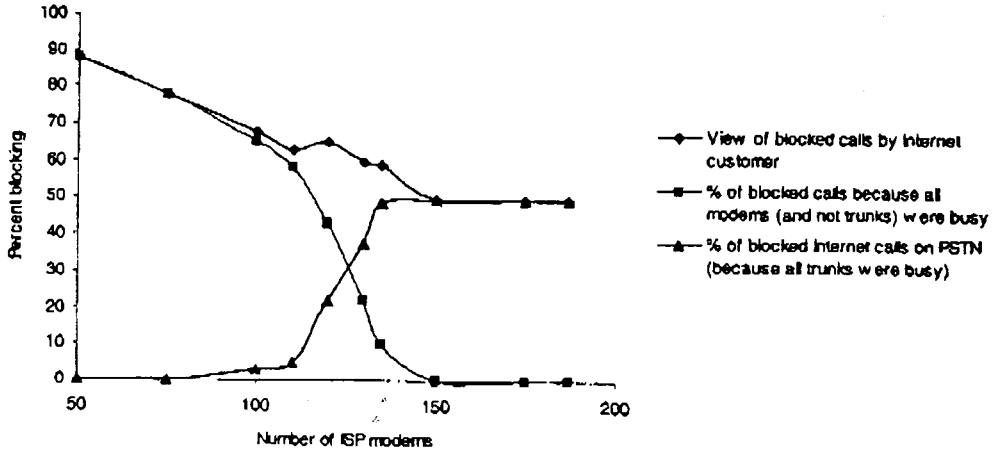

Figure 4: This graph, developed from a computer simulation, shows that the overall blocking depends strongly on the number of ISP modems. Refer to above text.

7 SUMMARY

7.1 Problems and Implications

Our measurement and simulation studies support the idea that Internet traffic, as well as POTS mixed with Internet traffic, have three key properties:

- *Increased call blocking on PSTN trunk groups:* Customer complaints have increased. Average blocking of calls on direct final trunk groups was five percent during 1997 in a large metropolitan area compared to an average of one percent up to the early part of this decade.
- *High reattempt rate:* Internet callers are persistent. They redial as many as 100 times when they encounter busy modems or busy trunks.
- *Long holding time:* On the average, Internet calls are about 20 to 25 minutes in length compared to 3 to 5 minutes for typical POTS calls.

7.2 New Attributes Causing Problems

Three properties of mixed PSTN and Internet traffic on the PSTN contribute substantially to the observed volatility and high blocking on the PSTN:

- *Volatile and service-specific blocking:* The long tail of the holding-time distribution (that is, the large spread among Internet call holding times) creates significant transient effects on blocking and estimates of call parameters. In addition, the differing call holding time distributions, by service class, will promote different call blocking for POTS and Internet callers when the Internet call arrival process is not Poisson. For this arrival process, POTS often experiences worse blocking than Internet access[h] [5].
- *Correlation between customer behavior and network blocking:* A strong linkage exists between the customer propensity to redial when all ISP modems are busy and the high blocking observed on LEC trunk groups. The long-term direction and intensity of the trunk blocking, up or down, depends on the next property.
- *Dependence of LEC and ISP network engineering:* The engineering of the PTSN by the LEC and the modem pool by the ISP can be strongly dependent. The effect on blocking on the other carrier's network is slight to moderate when only one of these carriers under-engineers its network. However, when both networks are under-engineered, the performance on the two networks is strongly linked. Furthermore, blocking on the LEC and ISP networks could move in the same or opposite directions, depending on the peakedness of offered loads, POTS and ISP modem capacities, customer retrial rates and customer retrial intervals.

7.3 Impact

While the observations of Section 7.1 and 7.2, based on new *network* measurements, analytical work and simulations might, by themselves, provide insight into the effects of Internet traffic on the PSTN, the associated *"business and economic data"* strongly re-enforce the importance of such observations and insights. Since Internet traffic on the PSTN began to grow substantially a few years ago, call blocking has surged in much of the network (overall average blocking reaching 5%), and instances of extremely high blocking persist. Customer complaints are increasing, and Local Exchange Carriers (LECs) are placing a high priority on "fixing the Internet problem". New engineering and traffic management techniques are required to ameliorate the costs of carrying such traffic at objective levels of service.

7.4 Future Work

Future papers will discuss new measurement, engineering and control techniques for more effective and efficient management of PSTN/Internet access traffic. Also, Bellcore is developing with equipment and service suppliers a network solution that segregates the Internet access traffic on a fast data network. [6]

REFERENCES AND SOURCES

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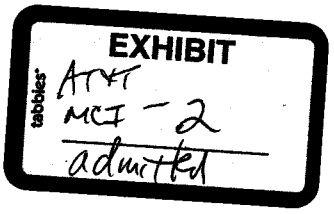
4. A. Atai, J. Gordon, "Internet, Fractals and PSTN Engineering," Convergence Magazine, Nov. 1996
5. A. A Fredericks, "Impact of Holding Time Distributions on Parcel Blocking in Multi-Class Networks, with Application to Internet Traffic on PSTN", ITC 16, Edinburgh, June 1999.
6. A. Atai, "A Time That's Come," Bellcore Exchange, Summer 1998

[h] This result is not inconsistent with properties of the Erlang-B distribution, which generally assumes Poisson arrivals for all traffic and a common (not distinct) holding time distribution for all classes.



BEFORE THE
ARIZONA CORPORATION COMMISSION

MARC SPITZER
Chairman
JIM IRVIN
Commissioner
WILLIAM A. MUNDELL
Commissioner
JEFF HATCH-MILLER
Commissioner
MARK GLEASON
Commissioner

IN THE MATTER OF INVESTIGATION INTO QWEST CORPORATION'S COMPLIANCE WITH CERTAIN WHOLESALE PRICING REQUIREMENTS FOR UNBUNDLED NETWORK ELEMENTS AND RESALE DISCOUNTS	)	DOCKET NO. T-00000A-00-0194 Phase IIA (Supplemental)

DIRECT TESTIMONY

OF

DOUGLAS DENNEY

ON BEHALF OF

AT&T COMMUNICATIONS OF THE MOUNTAIN STATES, INC.

AND WORLDCOM, INC.

APRIL 28, 2003

I. INTRODUCTION

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Douglas Denney. I work at 1875 Lawrence Street in Denver, Colorado.

Q. HAVE YOU PREVIOUSLY TESTIFIED IN THIS DOCKET?

A. Yes, I filed testimony in Phase I of this case, regarding geographic deaveraging. I also testified in Phase II of this case regarding the HAI Model.

Q. WHAT IS THE PURPOSE OF THIS TESTIMONY?

A. The purpose of this testimony is to explain and describe the impact of implementing flat rated switching, as is described in testimony of Joseph Gillan and Richard Chandler, into the HAI Model. Also, based on Qwest's concerns that the record needed to be reopened to resolve inconsistencies in the Commission's cost determinations by using results as they are calculated in the model, I will address the impact that the Commission's Phase IIA Order on switching had on loop cost estimates.

Q. PLEASE SUMMARIZE YOUR TESTIMONY

A. My testimony is divided into two parts. The first part demonstrates that the HAI Model can easily be modified, through a user adjustable input, to handle the fact that switching costs do not have a usage based component, as is described in detail in the testimony of Mr. Gillan and Mr. Chandler. To implement flat rated switching in the HAI Model, one needs simply to change the user adjustable input called the End Office Non-Port Fraction to zero. The result of this change, along with all of the Commission's previously ordered inputs, is a flat, per line per month, cost estimate for the switching functionality of $4.06. The usage, per minute, component would then be $0.0000. Changing this input does not

impact the total switch costs estimated by the model, but simply allocates the total costs between a fixed and usage component.

The second part of my testimony discusses the impact of the Commission's Phase IIA Order on the HAI Model in general and the loop cost estimate in particular. The HAI Model assigns network operations expense on a per line basis by using an 85% factor to Qwest's embedded network operations expense as ordered by the Commission, based on the relative direct cost estimates between loop and non-loop unbundled network elements ("UNEs"). The Commission's Phase IIA Order increased the switch cost estimates in the HAI Model above the level in the Model run produced in compliance with the Commission's Phase II Order on unbundled loops. This increase changes the relative direct cost estimates between the loop and non-loop elements in the Model, altering the allocation of network operations expenses, and increasing the amount of these expenses that were assigned to the switching element. The result is that the compliance run of the Model after the Phase IIA Order now produces average loop costs that are $0.12 *less* than the loop cost estimates in the Phase II compliance model run. If loop costs are not adjusted to reflect this change, Qwest will over-recover its forward-looking costs.

AT&T is not opposed to using the results from the HAI Model, as was advocated by Qwest in their motion to reopen the record. However, if the results of the model are to be faithfully applied, to prevent both under and over recovery, both the loop and switching cost estimates need to be adjusted.

Q. ARE THERE ANY EXHIBITS TO YOUR TESTIMONY?

A. Yes. My testimony contains the following exhibit:

Exhibit DKD-1

HAI Model Results with Commission Ordered Inputs and a 0% non-port fraction for local switching.

I. FLAT RATED SWITCHING COSTS FROM THE HAI MODEL

Q. CAN THE HAI MODEL BE ADJUSTED TO PRODUCE SWITCH COST RESULTS THAT REFLECT FLAT RATED SWITCHING, AS DISCUSSED IN THE TESTIMONY OF MR. GILLAN AND MR. CHANDLER?

A. Yes. There exists an input in the model called the End Office Non-Port Fraction, that allocates switching costs between a fixed ($ per line per month) and usage ($ per minute) component. By changing the End Office Non-Port Fraction to 0.0%, all of the switching costs are allocated to a fixed charge for the element.

Q. DOES CHANGING THIS FRACTION IMPACT THE TOTAL AMOUNT OF SWITCHING COSTS ESTIMATED BY THE HAI MODEL?

A. No, the fraction allocates total cost between a fixed and usage based switch UNE, but it does not impact the total cost estimated by the HAI Model.

Q. WHAT IS THE COST RESULT OF CHANGING THE END OFFICE NON-PORT FRACTION TO ZERO PERCENT?

A. The results from the 'Unit Cost' worksheet of the HAI Model are attached to this testimony as exhibit DKD-01. I ran the model with all Commission Ordered inputs from both the loop and switching phase of the case, but changed the End Office Non-Port Fraction to zero percent. The model results produce a fixed switch UNE cost of $4.06 per line per month.

II. EXPENSE ALLOCATION BETWEEN LOOP AND SWITCHING

Q. CAN YOU EXPLAIN WHY ATTACHMENT DKD-01 SHOWS A LOOP COST OF ONLY $11.99 WHEN THE COMMISSION-ORDERED RUN OF THE HAI MODEL IN THE LOOP PHASE OF THE CASE SHOWED RESULTS OF $12.11?

A. Yes. The change in the loop cost estimate is a result of expense allocations. When the model was run to establish the loop cost after the Commission's Phase II Order, the model was run with the HAI default inputs for the unbundled switching elements. The Commission's Phase IIA Order changed a number of switching inputs, which caused the switch costs estimates in the model to increase. Because network operations expense is estimated as a per line per month amount and is allocated to the various network elements based on relative costs, the result of the Commission's order on switching was to allocate more of the dollar per line network operations expense to the switching element and less to the loop element.

Q. HOW WAS THE NETWORK OPERATIONS EXPENSE DETERMINED BY THE COMMISSION IN THE LOOP PHASE OF THIS CASE?

A. The Commission ordered that the HAI Model should use an 85 percent forward-looking network operations factor.[1] This factor is applied to Qwest's embedded network operations expense. The result is $2.37 per line per month in expense to be allocated between the loop and non-loop UNEs. The model run in compliance with the Commission's Phase II Order estimated that the loop direct cost was 73.4% of total direct costs and thus $1.74 of the network operations expense was allocated to the loop with the remaining being allocated to non-loop UNEs. As a result of the increased switching cost

[1] Phase II Opinion and Order, Docket No. T-00000A-00-0194, June 12, 2002, pages 26 and 27.

estimates required in the Commission's Phase IIA Order, the proportion of loop direct costs to total costs fell to 69.6%. The model run in compliance with the Phase IIA Order thus allocates $1.65 of the network operations expense to the loop, with the remainder allocated to the non-loop UNEs.[2]

Q. WHY ARE YOU ADDRESSING THIS ISSUE NOW?

A. I am addressing this issue for two reasons: (1) to explain why Attachment DKD-01 shows a different loop rate than the rate that was previously ordered by the Commission; and (2) to be consistent with the justification Qwest made for reopening the record in this proceeding. Qwest, in petitioning to reopen this case, argued that the results of the model must be applied and if model results are ignored the "error will improperly deny Qwest full recovery."[3] Similarly, if the Commission ignores the reduction in loop costs that results from the reallocation of network operations expense resulting from Commission-ordered increases in switching investment , Qwest will over recover its forward looking costs.

Q. IS THE TWELVE CENT REDUCTION IN THE LOOP RATE RELATED TO THE COMMISSION'S DECISION REGARDING THE END OFFICE NON-PORT FRACTION?

A. No. The reduction in the loop rate is a result of the allocation of network operations expense between the loop and switching elements. Since the total switching cost

[2] The difference between $1.74 and $1.65 is $0.09. The remaining $0.03 difference to make up the $0.12 mentioned in the testimony is a result of expenses that are allocated to cost estimates in the model after network operations expenses are applied. These include other taxes, corporate overhead, carrier-to-carrier expense and uncollectible revenues.

[3] Qwest Corporation's Motion for Reconsideration of the Procedural Order or, Alternatively, for Submission of Qwest's Request to Reopen the Record to the Commission, Docket No. T-00000A-00-0194 Phase II-A, received March 7, 2003.

estimated by the model is not impacted by the End Office Non-Port Fraction, the twelve cent reduction in the loop cost estimate will result regardless of the Commission's determination of the proper value for the End Office Non-Port Fraction.

III. CONCLUSION

Q. WHAT ARE YOUR RECOMMENDATIONS TO THE COMMISSION?

A. Based on the results of running the HAI Model with the Commission Ordered inputs and setting the End Office Non-Loop Fraction to 0%, I recommend that the Commission establish the rates set forth in Table 1 below:

Table 1: Recommended UNE Rates

UNE	Cost
Loop (per line per month)	$11.99
Zone 1	$8.97
Zone 2	$14.72
Zone 3	$36.14
Switch Port (per line per month)	$4.06
Switch Usage (per minute)	$0.0000

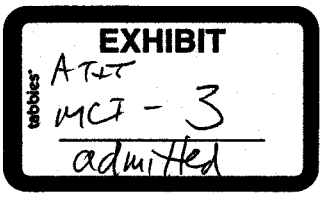
Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes.

Loop elements	0-5 lines/sq mi	5-100 lines/sq mi	100-200 lines/sq mi	200-650 lines/sq mi	650-850 lines/sq mi	850-2550 lines/sq mi	2550-5000 lines/sq mi	5000-10000 lines/sq mi	>10000 lines/sq mi	Totals
NID										
Annual Cost	$ 621,203	$ 2,691,795	$ 954,093	$ 2,339,948	$ 667,346	$ 5,465,374	$ 6,694,978	$ 2,751,295	$ 706,614	$ 22,892,646
Unit Cost/month	0.64	0.64	0.64	0.63	0.62	0.62	0.60	0.55	0.46	0.60
Loop Distribution (DLC)										
Annual Cost	$ 36,589,840	$ 62,890,704	$ 11,124,293	$ 18,028,629	$ 4,231,720	$ 27,663,593	$ 30,428,051	$ 13,947,810	$ 2,619,477	$ 207,524,117
Unit Cost/month	41.26	16.59	8.45	6.59	5.27	4.38	3.80	4.70	5.15	7.59
Loop Distribution (non-DLC)										
Annual Cost	$ 1,260,675	$ 3,591,872	$ 1,548,923	$ 5,898,634	$ 1,299,496	$ 10,575,466	$ 12,616,929	$ 9,451,112	$ 3,207,509	$ 49,450,615
Unit Cost/month	14.53	8.72	8.67	5.92	4.74	4.23	3.93	4.59	3.11	4.60
Loop Distribution (all)										
Annual Cost	$ 37,850,515	$ 66,482,576	$ 12,673,216	$ 23,927,263	$ 5,531,216	$ 38,239,059	$ 43,044,980	$ 23,398,922	$ 5,826,986	$ 256,974,733
Unit Cost/month	38.88	15.82	8.48	6.41	5.14	4.34	3.84	4.65	3.79	6.75
Loop Concentration (DLC)										
Annual Cost	$ 7,213,492	$ 18,647,606	$ 5,743,398	$ 11,799,174	$ 3,369,465	$ 26,539,908	$ 33,075,884	$ 12,154,205	$ 2,126,596	$ 120,669,728
Unit Cost/month	8.13	4.92	4.37	4.31	4.20	4.21	4.13	4.10	4.18	4.42
Loop Concentration (non-DLC)										
Annual Cost	$ 31,121	$ 140,379	$ 66,741	$ 335,385	$ 85,420	$ 844,919	$ 1,091,693	$ 634,742	$ 256,336	$ 3,486,736
Unit Cost/month	0.36	0.34	0.37	0.34	0.31	0.34	0.34	0.31	0.25	0.32
Loop Concentration (all)										
Annual Cost	$ 7,244,612	$ 18,787,984	$ 5,810,139	$ 12,134,559	$ 3,454,885	$ 27,384,827	$ 34,167,577	$ 12,788,947	$ 2,382,932	$ 124,156,464
Unit Cost/month	7.44	4.47	3.89	3.25	3.21	3.11	3.04	2.54	1.55	3.26
Loop Feeder (DLC)										
Annual Cost	$ 10,782,962	$ 7,058,507	$ 822,645	$ 1,502,955	$ 494,854	$ 4,241,790	$ 5,517,080	$ 2,687,275	$ 686,925	$ 33,794,993
Unit Cost/month	12.16	1.86	0.63	0.55	0.62	0.67	0.69	0.91	1.35	1.24
Loop Feeder (non-DLC)										
Annual Cost	$ 178,200	$ 918,185	$ 351,132	$ 2,081,896	$ 504,510	$ 4,307,499	$ 5,403,832	$ 3,632,757	$ 1,379,814	$ 18,757,823
Unit Cost/month	2.05	2.23	1.97	2.09	1.84	1.72	1.68	1.76	1.34	1.74
Loop Feeder (all)										
Annual Cost	$ 10,961,162	$ 7,976,692	$ 1,173,776	$ 3,584,851	$ 999,364	$ 8,549,288	$ 10,920,911	$ 6,320,032	$ 2,066,740	$ 52,552,816
Unit Cost/month	11.26	1.90	0.79	0.96	0.93	0.97	0.97	1.26	1.34	1.38
Total Loop (DLC)										
Annual Cost	$ 55,152,131	$ 91,024,710	$ 18,530,405	$ 33,045,947	$ 8,593,571	$ 62,359,095	$ 73,800,186	$ 30,413,372	$ 5,666,453	$ 378,585,870
Unit Cost/month	62.19	24.01	14.08	12.08	10.70	9.88	9.21	10.25	11.15	13.85
Total Loop (non-DLC)										
Annual Cost	$ 1,525,362	$ 4,914,337	$ 2,080,820	$ 8,940,674	$ 2,059,240	$ 17,279,453	$ 21,028,260	$ 14,845,823	$ 5,316,818	$ 77,990,788
Unit Cost/month	17.58	11.93	11.65	8.98	7.51	6.91	6.55	7.21	5.16	7.25
Total Loop (all)										
Annual Cost	$ 56,677,493	$ 95,939,046	$ 20,611,225	$ 41,986,621	$ 10,652,811	$ 79,638,548	$ 94,828,447	$ 45,259,195	$ 10,983,271	$ 456,576,658
Unit Cost/month	58.21	22.83	13.79	11.25	9.89	9.04	8.45	9.00	7.14	11.99
Total lines	81,135	350,227	124,526	310,878	89,760	734,239	935,125	418,990	128,235	3,173,116
Total lines served by DLC	73,904	315,891	109,644	227,875	66,920	525,795	667,533	247,329	42,367	2,277,258

Unit

	Annual Cost	Units		Cost	
End office switching	$ 144,269,313				
Line Port	144,269,313	2,959,791	switched lines	$ 4.06	per line/month
Non-Line Port	-	62,141,633,323	actual minutes	$ -	per actual minute (for rate per DEM, see "Cost detail" sheet)
				$ -	
Signaling network elements	$ 2,865,199				
Links	192,604	507	links	$ 31.66	per link per month
STP	2,234,461	41,094,682,805	TCAP+ISUP msgs	$ 0.00005	per signaling message
SCP	438,134	2,118,313,400	TCAP queries	$ 0.00021	per query
Transport network elements					
Dedicated					
Sw+Sp Transport	$ 9,115,815	333,511	trunks	$ 2.28	per DS-0 equivalent per month
Switched	3,285,029	120,186	trunks	$ 0.00023	per minute
Special	5,830,786	213,325	trunks		
Transmission Terminal	15,974,062	333,511	trunks	$ 3.99	per DS-0 equivalent per month
				$ 0.00040	per minute
				$ 0.00062	total per minute
Common					
Transport	$ 1,345,010	3,703,400,627	minutes	$ 0.00036	per minute per leg (orig or term)
Transmission Terminal	1,607,319	3,703,400,627	minutes	$ 0.00043	per minute
				$ 0.00079	total per minute
Direct					
Transport	$ 4,708,411	16,120,464,725	minutes	$ 0.00029	per minute
Transmission Terminal	7,051,747	16,120,464,725	minutes	$ 0.00044	per minute
				$ 0.00073	total per minute
Tandem switch	$ 1,817,867	3,322,868,975	minutes	$ 0.00055	per minute
				$ 0.00057	
Operator systems	$ 6,044,254				
Public Telephones	$ 4,825,844				
Total (w/ Public)	$ 656,201,499				
Total cost of switched network elements (w/o Public)	$ 17.02	per line/month			



BEFORE THE
ARIZONA CORPORATION COMMISSION

MARC SPITZER
Chairman
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IN THE MATTER OF INVESTIGATION INTO QWEST CORPORATION'S COMPLIANCE WITH CERTAIN WHOLESALE PRICING REQUIREMENTS FOR UNBUNDLED NETWORK ELEMENTS AND RESALE DISCOUNTS	)	DOCKET NO. T-00000A-00-0194 Phase IIA (Supplemental)

JOINT DIRECT TESTIMONY OF

JOSEPH GILLAN

AND

RICHARD CHANDLER

ON BEHALF OF

AT&T COMMUNICATIONS OF THE MOUNTAIN STATES, INC.,
AND WORLDCOM, INC.

April 28, 2003

I. INTRODUCTION

Q. Please state your names, business addresses and occupations.

A. Our names are Joseph Gillan and Richard Chandler. Mr. Gillan's business address is P.O. Box 541038, Orlando, Florida 32854. Mr. Gillan is an economist with a consulting practice specializing in telecommunications. Mr. Chandler is a Senior Vice President of HAI Consulting, Inc., with a business address of 1355 S. Boulder Road, #184, Louisville, Colorado 80027.

Q. Please briefly summarize Mr. Gillan's educational background and related experience.

A. Mr. Gillan is a graduate of the University of Wyoming and holds B.A. and M.A. degrees in economics. From 1980 to 1985, Mr. Gillan was on the staff of the Illinois Commerce Commission where he had responsibility for the policy analysis of issues created by the emergence of competition in regulated markets, in particular the telecommunications industry. In 1985, Mr. Gillan left the Commission to join U.S. Switch, a venture firm organized to develop interexchange access networks in partnership with independent local telephone companies. At the end of 1986, Mr. Gillan resigned his position as Vice President-Marketing/Strategic Planning to begin a consulting practice. Over the past twenty years, Mr. Gillan has provided testimony before more than 35 state commissions, five state legislatures, the Commerce Committee of the United States Senate, and the Federal/State Joint Board on Separations Reform. Mr.

Gillan currently serves on the Advisory Council to New Mexico State University's Center for Regulation. Mr. Gillan previously filed testimony on economic issues in this proceeding.

Q. Please summarize Mr. Chandler's background and experience.

A. Mr. Chandler holds BSEE and MSEE degrees from the University of Missouri and an MBA from the University of Denver. Mr. Chandler has also completed additional graduate study in electrical engineering at the University of Colorado, and worked as an electronic engineer at the Institute for Telecommunication Sciences studying microwave and optical propagation and analyzing radar systems. Mr. Chandler worked at Bell Laboratories in the exploratory and advanced development of customer switching systems. While at Bell Labs, Mr. Chandler worked extensively on packet switching and circuit switching technologies. Mr. Chandler transferred to AT&T, where he was a product manager working on, among other things, product strategies for advanced circuit and packet switching systems. After working at AT&T, Mr. Chandler joined a startup mobile satellite company as vice president of network engineering. In that role, Mr. Chandler developed the ground system network architecture, which included switching and signaling functions, for the proposed system.

At HAI (and its predecessor, Hatfield Associates, Inc.), Mr. Chandler has been the principal developer of the Hatfield/HAI cost models. In addition, Mr. Chandler

has analyzed a range of telecommunications technologies and systems for a number of clients. Many of these investigations have involved the study of packet switching technologies. Mr. Chandler has also taught graduate-level telecommunications technology courses in digital switching, including circuit and packet switching, basic telephony, and cellular and wireless communications, at the University of Colorado, the University of Denver, and Pace University. Mr. Chandler previously provided testimony on switching cost issues in Phase IIA of this proceeding.

Q. On whose behalf are you testifying?

A. We are testifying on behalf of AT&T Communications of the Mountain States, Inc. ("AT&T") and WorldCom, Inc ("MCI"). Although sponsored by these two companies, our perspective is that of consultants, each of whom has been actively involved in the technical and economic evolution of the telecommunications industry for 20 years.

Q. What is the purpose of your testimony?

A. The purpose of our testimony is to explain, from an economic and engineering perspective, why it is appropriate for the Commission to adopt a flat-rate structure for the unbundled local switching network element. Such a structure would recover the cost of unbundled local switching entirely through its port charge, with no separate rate for usage. As we demonstrate below, the usage-based

pricing of local switching is an anachronism, traceable to pricing and technological circumstances than no longer exist.

The unbundled local switching (ULS) network element is far different than the types of switching "services" that state commissions have reviewed in the past. Traditional switching cost models have attempted to "allocate" the cost of the local switch to the various services (such as local, access and calling features) that use this facility. When a CLEC leases the ULS network element, however, it purchases the ability to offer all of these services, no different than the incumbent when it purchases the switch from the manufacturer. Just as Qwest purchases its switching capacity from vendors paying a flat-rate, entrants should lease capacity in these same switches from Qwest under a flat-rate structure.

Moreover, the underlying cost structure of a modern switching system has changed over the years as advances in microelectronics have essentially rendered usage irrelevant as a design constraint. Unlike prior generations, best-in-class modern circuit switches, such as the Lucent 5ESS and Nortel DMS-100, are designed to reach capacity limits based on the number of lines connected to these switches, not the usage through them. As a result, forward-looking engineering principles support the elimination of a separate usage charge on CLECs leasing local switching UNEs.

II. THE ULS NETWORK ELEMENT AND LEGACY COST MODELS

Q. Please describe the ULS network element.

A. The ULS network element represents the lease of switching capacity on a per-port basis to an entrant. The ULS network element enables multiple carriers to offer exchange services, proportionally sharing the switching facility according to the number of line ports leased to each carrier (or used by the incumbent). For each port leased by an entrant, the entrant obtains the right to access all of the local switch port's features, functions and capabilities:

> [A] carrier that purchases the unbundled local switching element to serve an end user effectively obtains *the exclusive right* to provide all features, functions, and capabilities of the switch, including switching for exchange access and local exchange service, for that end user.[1]

In effect, the ULS network element provides its purchaser a "lock, stock and barrel" ability to provide *all* services to its end-users' lines, treating the capacity and potential of the switch as a common resource to be used by multiple exchange carriers.

[1] *Implementation of the Local Competition Provisions of the Telecommunications Act of 1996*, CC Docket No. 96-98, Order on Reconsideration, 11 FCC Rcd 13042, ¶11 (1996), *aff'd in part and remanded, AT&T v. Iowa Utils. Bd.*, 119 S. Ct. 721 (1997), *aff'd, Implementation of the Local Competition Provisions of the Telecommunications Act of 1996*, CC Docket No. 96-98, Third Report and Order and Fourth Further Notice of Proposed Rulemaking, FCC 99-238, ¶ 245 (rel. Nov. 5, 1999).

Q. Is this a different perspective on the "local switch" than that typically underlying the traditional ILEC cost modeling?

A. Yes. The ULS network element is a significant departure from the traditional view of a local switch as a "multi-product" investment. As a multi-product investment, ILECs have historically been interested in estimating the cost of *individual* switch uses (such as access, toll or a specific optional feature) so that a price for each of these "partial" uses could be established. The usage sensitive pricing of local switching stems from this traditional perspective that "every use must have its own cost, so that every use may have its own price."

The Commission can easily appreciate the difficulty, however, of trying to apportion switch investment among different uses, so that distinct retail prices could be justified. This task resulted in ILEC-sponsored switching cost models that became quite complex, with a predisposition towards using usage as a means to allocate cost, whether or not there was a causal link.

Q. Were legacy cost models "biased" by this retail orientation (and the incumbents' desire to assign costs to particular services?

A. Yes. The "granddaddy" of switching cost modeling is the Switching Cost Information System ("SCIS") model developed by BellCore (now Telecordia). SCIS was developed in the 1970s to estimate the cost of (then new) optional features and services that were being introduced by local telephone companies.

Although Qwest does not use SCIS, the US WEST "equivalent" model (developed in the mid-1980's) was based on the same overall approach, and is similarly designed to allocate switching investment to services and features.

Given the problem that these models were intended to solve – i.e., how to apportion common investment among individual features and functions of a switch – it should be expected that the initial architects would rely heavily on "relative use" as a way to allocate investment. Such a relative-use perspective leads to (i.e., rationalizes) the allocation of switching resources among different uses.[2]

Q. What design theory did the cost-modelers invoke to justify using usage to allocate the cost of the switch to different services?

A. To justify allocating cost based on "usage," ILEC cost models adopted the *assumption* that switch-processor and other "getting started" costs are driven by usage (as opposed to the number of lines and trunks connected to the switch).[3] This step was based on the view that a switch would reach capacity because of usage, and therefore would need to be replaced due to "usage-based" exhaust. By

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[2] For instance, the basic SCIS documentation makes clear that a primary motivation in the design of that model was to treat costs as usage-related. According to Bellcore itself, SCIS was developed to meet four objectives, including the objective that "*...cost results would be based on usage.*" (Switching Cost Information System, Bellcore Description, page 3). Said directly, the cost model produced a usage-cost because its architects preordained the result – a design goal for the model was a result that portrayed switching cost as a usage-sensitive investment.

[3] In blunt terms, the easiest way to *establish* causality is to *assume* causality.

this "logic," the fixed costs of a new switch could be "attributed" to usage. Armed with this assumption, cost models were developed that tried to "reverse-engineer" the switch price from the manufacturer (that was *not* based on usage) to determine how the manufacturer's price *might* have varied, had switches capable of accommodating different traffic requirements been purchased.[4] Of course, this logic (for lack of a better term) completely breaks down if the predicate – that switches plausibly exhaust based on usage – is false.

III. THE BASIC ARCHITECTURE OF A MODERN CIRCUIT SWITCH

Q. Please describe the basic architecture of a modern circuit switch.

A. Switching system architectures are generally organized into three functional divisions: control structure, switching network (sometimes referred to as the switching "fabric" or "matrix"), and "periphery." The periphery is where lines and trunks are connected to the switch. In their early implementations a few decades ago, stored-program-controlled switches were usage-limited – that is, the switches were designed to handle expected calling volumes and switches that were designed for greater "usage" could require additional investment.

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[4] The inherent oddity of this step in the process is sometimes overlooked. Switching "cost models" generally start with a *known* answer – i.e., the price that a manufacturer charges for a particular switch. The model then attempts to estimate *why* the manufacture established that price, for the purpose of claiming that a part of the price (which is not usage-based) is "caused" by usage. This approach is roughly equivalent to modeling *why* General Motors sells the H2 for $45,000, by using a model that attempts to determine what an H2 *would* cost if it could carry fewer passengers, and then telling your friends your H2 cost $35,000 plus $5,000 a head.

Q. What is meant by the term "usage" when discussed in the context of switching systems?

A. There are two separate and largely independent measures of "usage." One is the number of times an average user "requests service" (or places a call attempt) during a specified busy period, which is generally referred to as the "busy hour." The other is the total holding time (i.e., "off-hook" time, or time engaged in conversation) sustained by the average subscriber during the busy hour. Each of these usage components affects different parts of the generalized switching system structure.[5]

Q. Please describe the switch control structure.

A. The control structure is responsible for basic call processing functions, feature processing, maintenance, and other functions. The call processing function includes such responsibilities as detecting and processing call originations and terminations for both trunk and line ports, processing subscriber features, determining routing of interoffice calls, formulating and processing signaling messages for interoffice calls, and controlling the switch fabric.

[5] We note that usage outside the busy-hour is immaterial to this discussion because it impacts resources that would otherwise be idle.

Q. What is the role of the switch fabric?

A. The switch fabric provides connection paths between ports; it connects lines to lines, lines to trunks, trunks to lines, and trunks to trunks. In a forward-looking switch, the fabric transmits signals in a digital form. The fabric may consist of a time-slot interchange (TSI), a time-multiplexed space switch (TMS), or some combination of both.[6]

A single-module Lucent 5ESS, for example, includes a TSI as the basic switch fabric. A larger 5ESS consisting of several switching modules contains TSIs in each of the modules (which contain the line and trunk interfaces) and a TMS to interconnect the modules. This architecture is generally known as a T-S-T structure, because it contains "time" switches in the modules serving subscribers and trunks, and a "space" switch (or stage) that then interconnects these modules.[7]

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[6] A time slot interchange (TSI) "switches" by transferring the information from one time slot in a multiplexed data stream to another time slot in another multiplexed data stream. A space switch "switches" by connecting one physical switch port to another. A time-multiplexed space switch (TMS) connects a specific set of physical switch ports during one time slot interval and then reconfigures itself during the next time slot period to connect different physical ports together. TSIs and TMSs can be combined to provide very flexible switching configurations at very low or zero blocking levels as well as allow the basic switching system architecture to address a wide range of line sizes.

[7] An *intra*office call between lines terminated on different modules in this architecture would first traverses a time switch in the module serving the originating line, then a "space" switch that interconnects the modules, and then another time switch in the module serving the destination line.

Q. What is a switch's "periphery"?

A. The "periphery" is the part of the switching system where lines, trunks, and (typically) "service" circuits such as tone generators, digit receivers, and announcement sets are physically connected. These interfaces are usually known generically as "ports." The shelves, or carriers, in which the line, trunk, and other circuit boards are mounted include "backplane" connections to the switching fabric and control structure. These connections allow, for example, the control structure to detect requests for service from port circuits and to invoke control functions such as reading decoded dialed digits from digit receivers, applying and removing ringing voltage from line circuits, etc. Another set of backplane connections provides access to the switch fabric so that the line and trunk interface circuits can be "switched" to other line or trunk appearances.

Q. How do these different functional divisions affect switching system capacity?

A. The capacity limits of these functional divisions are essentially independent of each other and are usually separately addressed.[8]

Q. What limits the control structure capacity?

A. The control structure is most heavily involved in a call during the call setup process. Its capacity is thus most strongly affected by call attempts and feature activations; when a call is "stable," that is, when the connection has been

[8] *See, e.g.,, LSSGR: Traffic Capacity and Environment*, GR-517-CORE, Telcordia

established between the calling and called parties, the control structure has minimal involvement. The control structure's capacity limit is therefore typically expressed in terms of busy-hour call attempts (under some specified definition of the busy hour) and is often referred to as the switch's "real-time capacity."[9] Holding time (call duration) has little effect on the real-time capacity.

Q. What limits the switch fabric capacity?

A. The switch fabric is limited by the number of simultaneous connections it can support. Its capacity limit is thus affected by traffic and is usually expressed in traffic terms, either Erlangs or CCS.

Q. How is the switch periphery limited in capacity?

A. The peripheral (or port) limit is imposed by the physical design of the switch and is often expressed as the maximum number of ports (lines plus trunks) that can be physically connected (or, sometimes, just as the maximum number of lines that can be served).

Technologies (formerly Bellcore), Issue 1, December, 1998, ("*LSSGR*"), at 2-1 through 2-3.

[9] The term "real time" derives from the fact that switch control structure operate under what amount to "real time" operating systems in which certain control functions must be activated and completed within specified time boundaries. When the control structure effectively runs out of time to complete its required tasks, it is said to have exhausted its available "real time."

Q. Has the nature of switching system capacity limits changed over time?

A. Yes. When stored-program-controlled (SPC) end-office switches were first introduced forty years ago, their effective capacity was generally limited by processor performance. The processor and memory technology used in the early SPC switches was very "slow" by today's standards. As digital technology improved over the years since the first introduction of the Number 1 ESS in 1962, switch processor performance has gradually improved to the point where it no longer limits the effective capacity of forward-looking switching systems. The components used to construct switch processors have benefited from the same profound improvements in microprocessor performance and architecture that have vastly improved the performance of personal computers over the past several years.

Q. Can you provide an example of improvements in switch processor performance over time?

A. Yes. When the 5ESS was introduced in 1982, it had a processor capacity of about 100,000 busy-hour call completions.[10] Improvements in component technology and in the overall architecture of the switch's processor complex improved performance to 1,500,000 call completions per hour in 1998, and further

[10] Lucent uses "busy hour call completions" instead of "busy hour call attempts" as a measure of processor real-time capacity. This arguably is a more conservative statement of capacity.

improvements to increase the capacity beyond 2,500,000 call completions per hour were reported that year.[11]

Q. How does this increase in processor capacity compare to subscriber calling behavior?

A. Subscribers typically attempt about three to four calls in the busy hour.[12] In a forward-looking switch serving 100,000 such subscribers, the total busy-hour calling rate is therefore 300,000 to about 400,000 busy-hour attempts, which is well under half the real-time capacity of, say, a 5ESS as described above. Even with a very high, if not extreme, *average* calling rate of eight busy-hour call attempts per line, the switch could still handle those 800,000 calls per hour, which is just over *half* the capacity of the 5ESS control complex as stated over four years ago. Typical subscriber calling behavior thus does not begin to approach forward-looking processor capacity limits, even on very large switches.

Q. Do other switch manufacturers state similar performance figures?

A. Yes. Obviously, as one would expect, switches offered by competing vendors for similar applications will exhibit similar performance characteristics. Nortel, for example, advertised in 1999 a real-time capacity for its XA-Core processor, used

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[11] Richard Singer, Lucent Technologies, "Overview of 5ESS®-2000 Switch Performance," Workshop on Software and Performance (WOSP98), Santa Fe, New Mexico, October 12-16, 1998, p 9.

[12] *LSSGR*, p 6-8. These values pertain to average busy season busy hour (ABSBH).

in the DSM-100 and DMS family switches, of greater than 1.3 million busy-hour call attempts.[13]

Q. Does the fabric of a forward-looking switching system limit the practical capacity of the switch?

A. No. In fact, the switch fabric has generally never been the component limiting the performance of a switch. Switch fabric capacity is relatively inexpensive and, as a result, switch developers have designed switches with much greater traffic capacity than that required by subscribers. This fact simplifies the engineering of switches for specific installations.

Q. What is the implication of the above to the fundamental cost-model "assumption" that usage is a binding constraint (and, as a result, investment costs should be allocated based on usage)?

A. Today, forward-looking switches are generally considered "nonblocking" or "essentially nonblocking." A "nonblocking" switch fabric design effectively guarantees that any port can be switched, or can be assigned a "talking path," regardless of the state of any of the rest of the ports on the switch. Thus, the probability that a talking path will not exist for a given port (the "blocking" probability) is zero. In an "essentially nonblocking network," the blocking

[13] Nortel Networks Product Brief, "DMS SuperNode System XA-Core," 50250.02/12-99, 1999.

probability is generally a small fraction of one percent, say, one ten-thousandth of one percent or less.

Q. Then what constitutes the practical capacity limit of a forward-looking switch?

A. Because neither processor usage nor switch fabric usage limits the performance of a forward-looking switch, the practical switch capacity is imposed by the maximum number of lines that a carrier is comfortable serving from a single switch. As one ILEC made clear:

> Modern digital switches are designed to be port-limited. That is, enough switch fabric and processor capability is provided so that the normal peak call usage from the anticipated number of working ports, of all types on the switch, can be served within acceptable blocking criteria .... Put another way, there are enough usage-sensitive switch resources (but no more than are necessary) to handle all the minutes of use that the ports are forecasted to deliver in the normal peak period.[14]

Q. In a forward-looking switch, do realistic subscriber usage characteristics have any bearing on the overall capacity of the switch?

A. No. Forward-looking switches contain very robust control and switch fabric capacities that are not exhausted by realistic subscriber usage.[15] These switches

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[14] Testimony of J. Gansert, NYNEX, New York Case 95-C-0657, 94-C-0095 and 91-C-1174 consolidated, page 24.

[15] There are certain minor switch components, such as digit receivers, that are "engineered" according to certain design rules to serve expected demand. These devices, however, are relatively inexpensive and can easily be added to the switch if increased demand requires it. A shortage of digit receivers, for example, can lead to increased dial-tone delay. This is easily

are limited in size only by the maximum *number of subscribers* (or lines), and not the behavior of those subscribers, that carriers choose to serve by a single switching system.[16]

Q. Is it still necessary for service providers to "engineer" forward-looking switches?

A. Yes. An ILEC will obviously not install switches with maximum capacity in all wire centers. The processing and switching capacities of forward-looking switches are such that even heavy subscriber usage will generally not exhaust them even at maximum practical line sizes. Subscriber traffic behavior has been exhaustively analyzed and thoroughly characterized for many decades, and an ILEC will use well-established procedures to install suitably-sized switches to serve specific local demand. The principal point here is that the real-time and traffic capacity of such switches will not be approached by subscriber demand.

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remedied by equipping more such components. Any usage cost attributable to such components is minuscule and would not warrant the additional investment required in tracking and billing the usage of such inexpensive components. Other types of service circuits, such as conference circuits, also are "engineered." In the specific case of a conference circuit, any corresponding usage cost will again be very small and will normally be recovered through separate charges to the subscriber electing conference services (such as "three-way calling").

[16] Although a modern switch may physically be able to support well over 100,000 subscriber lines, carriers usually do not allow more than around 100,000 lines to be served by one switch. Even though telephone switching systems are usually designed with fully-redundant control structures and switch fabrics and large-scale failures are rare, they can still occur, and carriers correctly avoid exposing more than several tens of thousands of users to a potential full-office outage.

IV. IMPLICATIONS FOR THE PRICING OF THE UNBUNDLED LOCAL SWITCHING NETWORK ELEMENT

Q. What does the above discussion mean for the appropriate rate structure of the unbundled local switching network element?

A. It is important that entrants pay prices to *lease* unbundled local switching that parallel, as closely as possible, the manner in which the *cost* is incurred. As explained above, the historic rationale to impose usage charges for switching no longer exist. Moreover, as Qwest's switch-purchase contracts have become available for review in a number of cost proceedings across its region, it is clear that Qwest does not pay for its switches through a usage rate. If a flat-rate structure is good enough for the company *selling* the switch, and it is good enough for the company *buying* the switch, how can it not be good enough for a CLEC *leasing* it? In order for CLECs to pay a cost-based rate for local switching, the appropriate rate structure should recover this cost through a flat-rate per switch port.

Q. Is the switching rate structure issue competitively significant?

A. Yes. This is no small debate – the rate structure Qwest recommends would impose on CLECs a cash-outlay, for each and every minute, of each and every call, that their customers make, even though Qwest would incur no such cost. This would create very different cost-implications for CLECs than Qwest for calls that are identical, introducing a serious distortion to the market. This is particularly critical in a local market where the dominant provider (Qwest) offers

flat-rate service and the market is moving towards *more* flat-rate offerings.[17] In such an environment it is absolutely critical that CLECs not be penalized through a contrived usage rate for local switching.

Q. Does Qwest purchase switches by paying manufactures a "usage rate"?

A. No. In other states where Qwest vendor contracts have been evaluated, that review demonstrates that Qwest purchases switching by paying a flat rate, albeit a flat-rate that may increase as the capability of the switch increases.[18] The fact that Qwest's pays more (on a flat rate basis) for a switch with more capability than another switch, however, is not a reasonable basis to impose a usage cost on CLECs sharing those *same* switches each and every time their subscriber makes (or receives) a call.

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[17] For instance, consider the recently announced MCI Neighborhood, which even eliminates usage pricing of long distance service. These types of pricing plans are being very well received by customers, and will likely become the competitive-norm in short order.

[18] SBC-Ameritech has also confirmed that switching costs are invariant to usage at or below design-levels. (*See* Direct Testimony of William Palmer, ICC Docket 96-0486, Ameritech-Illinois Exhibit 3.3). Moreover, SBC-Ameritech clearly purchases switching capacity on a per-line basis:

> By the terms of the [switch vendor] contracts, Ameritech buys switching equipment by paying a one-time price for each line that it demands. The line prices do not vary with the number of lines purchased, nor with the year of purchase, nor with the state in which the equipment is to be installed; the contracts are region-wide.

Ameritech Ohio Exhibit 2.4, page 1, Public Utility Commission of Ohio, Case No. 96-922-TP-UNC.

Q. Doesn't a variation in per line prices in Qwest's switching contracts according to the level of usage engineered in the switch indicate that switching costs are incurred on a usage sensitive basis?

A. No. Qwest made that argument in proceedings before the Minnesota and Utah Commissions, and it fundamentally misses the point. Switches, like other equipment or facilities, are constructed to have a certain capacity. Not surprisingly, switches with greater capacity cost more on a per line basis than switches with less capacity. The same, however, is true of loop plant and other facilities. DS3 circuits, for example, have a greater capacity and are more costly than DS1 circuits, but that does not mean that loops are usage sensitive simply because they are engineered to have different capacity. A variation in costs based on the level of capacity does not justify charging a usage sensitive rate – it would only affect the level of the appropriate flat charge per port.[19]

Q. But if usage of an existing switch increases, doesn't Qwest incur greater costs to increase switch capacity?

A. No. As we previously discussed, modern switches are engineered with capacity far above that required to serve well-characterized per-subscriber usage. The only

[19] We note, moreover, that even if "busy-hour" usage may have influenced initial switch design, that would never justify a non-differentiated usage rate that applied to every minute, at all times of the day. As we explain, there is no reason to adopt any usage rate, while Qwest's response (at most) would only justify a rate applicable to peak usage at the busy hour. The rate structure Qwest recommends, even under its own cost-theory, however, would misprice usage 23 hours out of the day. While we do not believe that a time-of-day rate structure is appropriate, it is useful to note that Qwest never recommends the rate structure that matches its own cost-theory.

legitimate capacity limitation is the number of lines served by the switch, which reflects the number of telephone subscribers, not the extent to which those subscribers use the switch.

Q. Don't Qwest's switch contracts also include charges for trunks in addition to per line prices for the switch?

A. Yes, but again, that fact does not mean that switching costs in general are usage sensitive. Qwest's vendors charge Qwest the vast majority of Qwest's switching costs on a per line basis. Trunks are the portals for connections between switches, which permit customers served by one switch to make calls to customers served by a different switch. Qwest engineers its network to ensure that the ratio between the lines and the trunks served by a switch are sufficient to accommodate all inter-switch calls. Thus, it is quite simple to include expected trunk costs in the per-line charge that we recommend. Moreover, where Qwest does augment trunks, that action is driven primarily by the need to interconnect with other carriers, including CLECs, long distance carriers, and wireless carriers, and Qwest is separately compensated for such interconnection. Qwest seldom must augment trunk capacity to accommodate inter-switch calls between its own customers, and even then, such costs are insignificant compared with Qwest's other switching costs.

Q. Might not CLEC customers have higher usage levels than current Qwest customers, increasing the demand on (and correspondingly the cost of) Qwest's switches?

A. No. This is yet another red herring that Qwest has raised in other states. First, as discussed above, modern switches are engineered to accommodate more usage than any subscribers – CLEC or Qwest – are reasonably likely to have.

Second, there is no reason to expect (a priori) that the usage profile – particularly the *peak* usage profile – of a CLEC's subscribers served using unbundled local switching would systematically differ from the usage profile of Qwest's customers served by that switch. Unbundled local is principally used by CLECs to compete for mass-market customers – the exact *same* customers that are served by these switches today.[20] Thus, the design limits of the local switch are unlikely to be more affected by individual CLECs (or their customers) than they are by Qwest.

Because CLECs will be serving the same customers that are served by the switch today, each CLECs' expected contribution to peak demand should correlate closely with the proportion of the lines that it serves. Consequently, a per-line

[20] A primary reason that CLECs use unbundled local switching is because it offers the same footprint as the incumbent and permits for customer migrations without manual reconfiguration to alternative switching facilities. Consequently, there would be no reason for a CLEC to serve different customers than the incumbent serves using unbundled local switching.

charge on CLECs should approximate a CLEC's proportional responsibility to peak usage at least as well as the CLEC's total usage.

Q. Has Qwest itself acknowledged the fact that forward-looking switches are in fact not usage-sensitive?

A. Yes. Qwest witness Paul McDaniel stated the following in a filing at the Colorado Public Utilities Commission in October, 2002:

> The nature of switching costs has changed significantly over time with advances in digital technology. Switching costs today are more line-driven than traffic-sensitive. It is not unreasonable to model switching costs now as depending entirely on the number of line-side ports and the number of trunk-side ports. Switching costs in such a model can be reasonably recovered entirely as fixed monthly charges.[21]

Moreover, Qwest witness Harry M. Shooshan III used precisely the same language in testimony before this Commission in July, 2002.[22] Finally, we would note that Qwest generally opposes the deaveraging of local switching prices, noting "switching costs do not vary in an significant way between zones."[23] Of

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[21] Direct Testimony of Paul R. McDaniel, "IN THE MATTER OF THE JOINT APPLICATION FOR APPROVAL OF A PLAN TO RESTRUCTURE REGULATED INTRASTATE SWITCHED ACCESS RATES AND PETITION FOR A COMMISSION ORDER DECLARING THE PLAN TO BE APPLICABLE TO ALL LOCAL EXCHANGE CARRIERS IN COLORADO," October 4, 2002, at p 19.

[22] The Investigation of the Cost of Telecommunications Access, Docket Number T-00000D-00-0672, page 25.

[23] *See*, for instance, Brigham Direct Testimony, DOCKET NO. 01-049-85, Utah Public Service Commission, page 27.

course, given the fact that switch usage would vary, the only reason that costs would not would be the fact that switching costs are not sensitive to usage.

Q. Have other states concluded that the ULS network element should be flat-rated?

A. Yes. Minnesota, the only one of the states in which Qwest is the incumbent local provider to have ruled on the issue, has adopted flat-rated UNE local switching.[24]

Outside the Qwest region, the Illinois Commission also conducted an extensive examination of the cost-justification for usage charges associated with the ULS network element. At the conclusion of that proceeding, the Illinois Commission rejected Ameritech-Illinois' proposal to impose a usage charge:

> Because Ameritech incurs switching costs on a predominantly per-line [i.e., per line-port] basis, we find it consistent with the fundamental principles of cost causation that the ULS subscriber should also pay the ULS element primarily on a per line basis.[25]

More recently, the Illinois Commission again rejected SBC-Ameritech's efforts to impose a usage sensitive rate, finding that:

> Our extensive investigation of Ameritech's ULS cost structure conclusively demonstrated that Ameritech's switch costs are not usage sensitive, and Ameritech's attempt to unilaterally reclassify

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[24] *Order Setting Prices and Establishing Procedural Schedule*, MPUC Docket Nos. P-421/CI-01-1375, *et al.* (October 2, 2002). A decision is pending in Utah, the only other Qwest state to have been presented with the issue.

[25] *Second Interim Order*, ICC Docket 96-0486 and 96-0569 Consolidated, Illinois Commerce Commission, February 17, 1998, page 59.

the local switch as usage sensitive is a blatant violation of our TELRIC Order.[26]

In addition, the Wisconsin Commission has voted to adopt a flat rate for the unbundled local switching element, recognizing that it is more cost-based,[27] as well as the Indiana Commission.[28]

Q. But haven't AT&T and MCI previously advocated usage sensitive pricing for UNE local switching, including in Phase IIA of this proceeding?

A. Yes, that is our understanding. However, as we noted above, the usage based pricing of unbundled local switching is an industry *practice* whose justification has disappeared with advances in technology and as the regulatory focus has shifted from "retail service" to the "wholesale network element" at issue here. The fact that it took some time for this change to occur within AT&T and MCI is regrettable, but understandable (given the size of the organizations). All new ideas, however, must start as *new* ideas, and we recommend that this idea be judged on the merits as we have explained them. The Commission should adopt a flat-rate structure for unbundled local switching in this phase of the proceeding.

Q. Does this conclude your testimony?

A. Yes.

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26 Order, Illinois Commerce Commission Docket 98-0396, page 68.

27 Open Meeting, December 13, 2001, Docket 6720-TI-161.

28 Order, Cause No. 40611-S1, Phase I, March 28, 2002, page 42.

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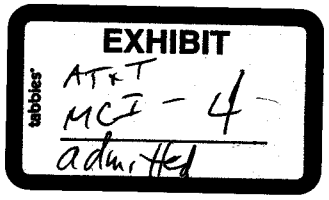

BEFORE THE
ARIZONA CORPORATION COMMISSION

MARC SPITZER
Chairman
JIM IRVIN
Commissioner
WILLIAM A. MUNDELL
Commissioner
JEFF HATCH-MILLER
Commissioner
MARK GLEASON
Commissioner

IN THE MATTER OF INVESTIGATION INTO QWEST CORPORATION'S COMPLIANCE WITH CERTAIN WHOLESALE PRICING REQUIREMENTS FOR UNBUNDLED NETWORK ELEMENTS AND RESALE DISCOUNTS	)	DOCKET NO. T-00000A-00-0194 Phase IIA (Supplemental)

JOINT REBUTTAL TESTIMONY OF

JOSEPH GILLAN

AND

RICHARD CHANDLER

ON BEHALF OF

AT&T COMMUNICATIONS OF THE MOUNTAIN STATES, INC.,
AND WORLDCOM, INC.

May 12, 2003

Q. Please state your names, business addresses and occupations.

A. Our names are Joseph Gillan and Richard Chandler. We previously filed direct testimony on behalf of AT&T Communications of the Mountain States, Inc. ("AT&T") and WorldCom, Inc ("MCI").

Q. What is the purpose of your rebuttal testimony?

A. The purpose of our rebuttal testimony is to comment on the testimony of Staff witness William Dunkel. For the most part, we are encouraged by Mr. Dunkel's testimony concerning local switching, in particular Mr. Dunkel's focus on cost-recovery and his intention to review testimony with an open mind. We believe this focus should lead him to conclude that the traditional legacy view of local switching – with its assumption that a usage-based rate element is appropriate -- is inconsistent with its underlying cost structure and, as a result, the goal of cost recovery.

Q. Please summarize Mr. Dunkel's testimony on local switching.

A. The principal point of Mr. Dunkel's testimony appears to be that "...the total cost of the switch (as determined by the HAI run) should be recovered...."[1] Mr.

[1] Direct Testimony of William Dunkel on behalf of the Staff of the Arizona Corporation Commission ("Dunkel Direct"), page 6.

Dunkel goes on to express concern that "100% of the switch costs would not be recovered" without some clarification by the Commission.[2]

Q. What rate structure best assures that Qwest will recover its cost of local switching?

A. The rate structure that will best assure Qwest's recovery of local switching costs is the flat-rate rate structure recommended in our direct testimony. As we explained in our direct testimony, Qwest does not incur switching costs based on the usage through its switches. Consequently, a usage-based rate element virtually assures that Qwest will either under-recover, or over-recover, its switching costs, because actual usage will almost certainly vary from forecast usage. The best way to assure that Qwest recovers its investment cost (no more and no less) is to recover that cost entirely through more stable port rates, rather than through usage charges that will fluctuate with changes in usage patterns.

Q. Does Mr. Dunkel's testimony justify a usage rate element?

A. No, we do not believe that it does (nor do we believe that Mr. Dunkel intended that it do so).[3] Although Mr. Dunkel's testimony does include a reference to the traditional legacy view that some switching costs may be "traffic-sensitive," the reference is neither detailed nor documented:

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[2] *Ibid.*

[3] As we note later in our testimony, Mr. Dunkel makes clear his intention to review the evidence in this proceeding before making a recommendation.

> ... inside the switch there is what is called the switching network (sometimes called the "switching fabric"). This is the equipment that switches calls. This cost is for switching traffic, and is therefore properly considered to be a traffic sensitive cost.[4]

As we explained in our direct testimony, however, technological change has radically changed the underpinnings of this legacy view – it is no longer true that costs associated with "switching traffic," are properly viewed as "traffic sensitive" with respect to pricing and cost recovery.

We understand that legends fade away slowly, but fade away they must. As one witness explained to the Utah Commission, the legend of usage-sensitive switching costs (as would befit any legend) has existed for some time:

> As a young engineer 1980 or so coming into the telephone system, I was indoctrinated, [ ] as everyone else was at the time, that switches were usage-based much for the reasons that were just discussed. And last year when I was approached in Minnesota with the question of can we eliminate that usage-based sensitivity in a switch, I have to admit, I found it very difficult to say: Yes, we can eliminate that today because for years, and years, and years in my career we thought about switches as having to be usage-based. [But] the facts point today to [the] fact that in reality they are not usage-based.[5]

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[4] Dunkel Direct, page 7.

[5] Testimony of Wes Legursky, Utah Public Service Commission Docket No. 01-049-85, Tr. 142, December 18, 2002.

It is now time that fact replace legend. It is our understanding that Mr. Dunkel has not conducted an analysis to determine whether the charges for local switching should include a usage rate in Arizona and that he intends to review the evidence presented by the parties on the issue.[6] We believe that the evidence will clearly demonstrate that unbundled local switching should be priced on a flat-rate basis.

Q. Have any additional Qwest states adopted the reformed view of switching cost structure that you recommend?

A. Yes. The Utah Public Service Commission recently decided to adopt a flat-rate structure for unbundled local switching, joining the Minnesota Commission (in the Qwest region), and the states of Wisconsin, Illinois and Indiana (in the Ameritech region) that have reached the same conclusion:

> The Commission finds that where possible, costs should be billed to CLECs in the same manner as they were incurred by Qwest. To do otherwise sends distorted price signals that will artificially induce or retard the development of competition for the related services. Certainly the experience the industry has gone through with reciprocal compensation illustrates the futility and danger of devising artificial pricing structures.
>
> Qwest is charged a flat, fixed, per line price for switching once basic capacity and design issues have been accounted for. Given that a TELRIC network is designed to meet current demand, the capacity issues at stake in this issue will have been accounted for in the modeler's inputs and assumptions ...switching will be billed on a flat-rate basis, with no usage charges.[7]

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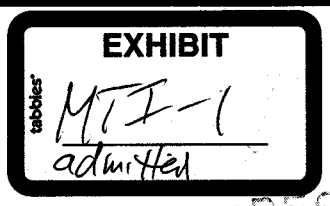
[6] Dunkel Direct, page 8.

[7] Order, Utah Public Service Commission Docket No. 01-049-85, May 5, 2003, page 16.

We similarly encourage the Arizona Corporation Commission to adopt a flat rate structure for unbundled local proceeding here.

Q. Does this conclude your rebuttal testimony?

A. Yes.



BEFORE THE ARIZONA CORPORATION COMMISSION

MARC SPITZER
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IN THE MATTER OF INVESTIGATION INTO QWEST CORPORATION'S COMPLIANCE WITH CERTAIN WHOLESALE PRICING REQUIREMENTS FOR UNBUNDLED NETWORK ELEMENTS AND RESALE DISCOUNTS	DOCKET NO T-00000A-00-0194 PHASE II
ARIZONA CORPORATION COMMISSION Complainant v. QWEST CORPORATION Respondent	DOCKET NO. T-01051B-02-0871

DIRECT TESTIMONY OF MICHAEL LEE HAZEL

Q.1 Please state your name, position, and business address?

A.1 My name is Michael Lee Hazel. I am Vice President, Network, Mountain Telecommunications, Inc. My business address is 1430 W. Broadway, Suite A-200, Tempe, Arizona 85282.

Q.2 How long have you been employed by Mountain Telecommunications, Inc. (MTI)?

A.2 I have been employed by MTI since its founding in 1997.

Q.3 Please summarize your current responsibilities?

A.3 As Vice President, Network, I am responsible for management and operation of the MTI network, including the deployment and operation of existing voice and data network switching and transmission facilities. This includes more than 3,000 modems online with Internet service providers. My recent responsibilities have included such projects as the migration from interim number portability to permanent local number portability, the deployment of ten rural collocations, and negotiation of MTI's interconnection agreement with Qwest. My duties include the procurement of interconnection facilities and circuits and the management of MTI's use of Qwest network facilities and services. In addition, I audit and verify the invoices which Qwest renders to MTI for network services and facilities. I also work with MTI management and with outside legal counsel in analyzing regulatory proceedings which affect MTI's interests and in participating in such proceedings, where appropriate.

Q.4 Please describe your prior professional experience and post-secondary education?

A.4 Attached to this testimony as Attachment 1 is a resume which describes my prior employment and education.

Q.5 Has MTI recently experienced increases in prices charged by Qwest for Transport?

A.5 Yes. Beginning in January 2003, MTI began receiving invoices from Qwest which contained rates for Transport that were substantially higher than those that had been in effect prior to the Commission's Phase II Decision in Docket No. T-00000A-00-0194 (Decision No. 64922, issued June 12, 2002). These significantly increased Transport charges did not seem to be contemplated either by the letter or the spirit of the Phase II Order and were not anticipated by MTI. Based upon recent filings which have been made by other companies (including, for

example, Time Warner Telecom and Electric Lightwave), it appears to me that these rate increases were not expected by other competitive local exchange carriers either. After receiving those invoices, MTI filed with the Commission applications to intervene in each of the above-captioned proceedings. In addition, MTI filed a motion for injunction which asked the Commission to enjoin Qwest from charging Transport rates which MTI believes to be unjust and unreasonable. MTI explained in its injunction motion as well as in its application to intervene and supplement to its application to intervene that Qwest's revised and increased Transport rates following implementation of the Phase II Order would increase MTI's costs by approximately $55,000 per month – an increase of approximately 78 percent. It is important to note that those cost increase figures are based on MTI's current usage. As MTI's business grows and its usage of Qwest services increases, that amount will continue to grow.

Q.6 Are you familiar with Staff's Response to the Motions of MTI, Qwest and Time Warner, which was filed on March 7, 2003 in these docketed proceedings?

A.6 Yes. Staff's Response was filed after Staff had conducted its own discovery into the allegations which had been raised in MTI's applications to intervene and motion for injunction. Based upon that discovery, Staff determined that Qwest's combination of Transport and Entrance Facility charges into one rate is "producing an unexpected and unreasonable rate increase . . . which was not intended by the Phase II Order." As Staff noted in its Response, carriers do not always lease Entrance Facilities from Qwest when they acquire Transport services, and Qwest's inclusion of Entrance Facility charges in all Transport rates results in significantly higher charges for those carriers.

Q.7 Are you familiar with Staff's recommendations with respect to Transport charges?

A.7 Yes. Noting that the resulting Transport charges were not what was contemplated either by the Commission or by the parties, Staff has recommended that the Commission reopen the record in Phase II on its own initiative to review the Transport pricing issue and that it grant relief under either of two options pending further review of Transport pricing in Phase III.

Q.8 Please describe the two options proposed by Staff?

A.8 Under Staff's first option (Option 1), the Commission would reinstate the Entrance Facility Direct Trunked Transport recurring charges which were in effect prior to Qwest's implementation of the Phase II Order. Under Option 1, MTI and other interconnecting carriers would pay only for facilities they actually lease from Qwest rather than be subjected to bundled rates which include Entrance Facility charges, even in situations where no Entrance Facilities are provided. Under the second option (Option 2), the Commission would require Qwest to deduct the prior Entrance Facility recurring rate (*e.g.*, $89.42 for a DS1 entrance facility) from the new combined rate for those Direct Trunked Transport facilities to which the prior Entrance Facility rate did not apply. I understand that Staff's Options would be applicable to all Transport facilities, including DS1 and DS3 facilities. This is an important point as Qwest's rate increases for DS3 Transport have been even more egregious than those which we have experienced for DS1 Transport. As MTI described in its supplement to its application to intervene and in its motion for injunction, it has received invoices for DS3 facilities in the amount of $1,834.61 for facilities which were charged at a rate of $353.05 prior to Qwest's implementation of the Phase II Order. Even backing out the entrance facility charge of $357.16, the charge for DS3 facilities has skyrocketed to $1,446.35 following Qwest's "implementation" of the Phase II Order. Nothing which I have been able to find in the Phase II Order contemplates such a dramatic increase in DS3 rates, nor has Qwest offered any explanation.

Q.9 Which of Staff's recommendations should be adopted?

A.9 Option 1 is the more appropriate solution to the problem occasioned by Qwest's implementation of bundled Transport rates which included Entrance Facility charges. It is the option which should be ordered by the Commission. At the outset, it should be noted that the problems which have resulted from Qwest's implementation of bundled Transport rates which include Entrance Facilities is entirely of Qwest's own making. Nothing in the Phase II Order nor in Qwest's compliance filings made subsequent to that order provide any indication that such massive Transport pricing increases were contemplated by the Commission, by Qwest or by Staff. Indeed, in my capacity as Vice President, Network, MTI, I contacted Qwest in November 2002 to inquire how it planned to establish Transport rates. I never received a direct response to my inquiries and did not learn about Qwest's plans for Transport rates until we began receiving invoices in January 2003. Beginning in January 2003, Qwest has rendered invoices to MTI reflecting the increased bundled Transport rates retroactively back to June 12, 2002 – the effective date of the Phase II Order.

Q.10 Why is Staff's Option 1 the more appropriate solution to the Transport Pricing Problem identified by Staff and by MTI?

A.10 Option 1 would provide several advantages over Option 2. First, it would be simpler to implement and could be implemented in a more timely manner. There would be no need to separately identify which Transport circuits do not utilize Entrance Facilities and which circuits should include Entrance Facility charges. Since the rate changes implemented by Qwest were not contemplated by the Phase II Order and since certain of the changes involve issues which will be addressed by the Commission in Phase III of this proceeding, the most efficient manner to redress the situation is for the Commission to direct Qwest to reinstitute those rates which were

in effect prior to the Phase II Order. This will protect the interests of all affected parties, will maintain the status quo, and will afford the parties an ample opportunity to conduct the needed discovery and to develop a complete record and will enable the Commission to complete Phase III without being subject to the external pressure of unintended interim rates having a disruptive impact on local competition pending completion of Phase III. There is another reason why Option 1 is preferable. While Staff points out correctly that Qwest's bundling of Entrance Facilities into Transport rates is a cause of excessive and unanticipated rate increases, it is not the only reason for such increases. For example, Qwest has chosen to impose significant rate increases on services which were not intended to be subject to rate increases including, for example, multiplexing. As part of its "implementation" of Decision 64922, Qwest has increased its monthly charges for multiplexing provided to MTI from $196.85 to $228.05, *i.e.*, by 14 percent. I have reviewed the Commission's Phase II Order and can find nothing in it that Order which contemplates such increases to Qwest's multiplexing rates. Indeed, multiplexing is among the services listed at page 80 of the Phase II Order about which the Commission stated that "sufficient evidence does not exist in the record for purposes of rendering a decision." The Commission also said that it would not be "appropriate to adopt prices for services for which there is not an adequate record." Rates for those services, including multiplexing, were deferred to Phase III. With respect to those services which were deferred to Phase III, the Commission stated at page 81 of the Phase II Order that "the current rates will remain in effect until different rates are established in Phase III." In view of the Commission's clear directive not to change the rates for multiplexing until those issues are resolved in Phase III, I do not understand how or why Qwest chose to increase the multiplexing rates – and to attempt to do so back to June 12, 2002. Also, as described in my answer to Question No. 8, Qwest has imposed dramatic increases in its

rates for DS3 facilities and those increases are not completely explained by inclusion of entrance facility charges. Qwest should not be allowed to implement those DS3 rate increases without explanation or justification and without express Commission approval of those increases. Staff Option 1 would have the desirable result of achieving for multiplexing rates, as well as for the Transport rates, precisely what the Commission ordered in the Phase II Order – maintaining the then-current rates in effect until different rates are established in Phase III.

Q.11 Should the revised rates that are determined in this proceeding be effective as of June 12, 2002 or as of the effective date of an Order adopting the revised rates?

A.11 Unquestionably, whatever rate adjustments are ordered by the Commission following the expedited hearing in this proceeding should be effective retroactive to June 12, 2002. Whether the Transport rates which have been imposed by Qwest for the purported reason of complying with the Phase II Order are violative of that Order or whether the rates resulted from latent ambiguities in the Phase II Order, the result is the same. As Staff so correctly noted in its Response, those rates have produced an "unexpected and unreasonable rate increase . . . which was not intended by the Phase II Order." Whatever was intended by the Phase II Order was intended to be attained on June 12, 2002 – the effective date of the Order. Those "unexpected and unreasonable" Transport rate increases identified by Staff have been unexpected and unreasonable since June 12, 2002. They did not first become unexpected and unreasonable when Staff filed its Response; neither will they first become unexpected and unreasonable upon issuance by the Commission of an order at the conclusion of this expedited proceeding. As a result of Qwest's rendering of invoices containing these unexpected and unreasonable Transport rate increases retroactive to June 12, 2002, there is no doubt that incorrect and unlawful rates have been charged by Qwest since June 12, 2002. As described in my answer to Question No. 10

above, the same is also true with respect to the rates being charged for multiplexing. Immediately upon learning of Qwest's new and increased Transport rates through receipt of those aforementioned invoices, including those containing retroactive charges, MTI deemed it necessary to bring this matter to the Commission's attention on the record of these proceedings through the filing of its applications to intervene and its motion for injunction. Staff's Response reflects its concurrence that improper Transport rates have been charged since June 12, 2002. To me, this is a simple question which calls for a simple answer. If improper rates have been imposed since June 12, 2002, the only complete and proper remedy is to order the implementation of proper rates to be effective that same date – June 12, 2002.

Q. 12 Does this complete your testimony?

A. 12 Yes it does.

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Suite A-200
Tempe, AZ 85282
(480) 850-7566

Michael Lee Hazel

Vice President, Network
Mountain Telecommunications, Inc.

Background

Mike Hazel joined MTI at the time of its founding and has been with the company since the beginning. Currently, Mike Hazel is Vice President, Network and manages network operations, including network deployment, operations and customer implementation. He is responsible for deployment and operation of the existing voice and data network including over 3,000 modems online with wholesale and collocated ISPs. His recent projects include completing migration from INP to LNP (first CLEC to complete in USW territories), deployment of ten rural collocations and negotiating the first Phase II, 4 -year Interconnect Agreement with the ILEC (Qwest).

Prior to joining MTI, Mike Hazel was responsible for integrating customer networks and applications into a cellular data network. His functions included Project Manager, WAN/LAN design and integration, application selection and optimization, internal and external support, presentation and training on CDPD, LAN, WAN and TCP/IP technologies. His prior primary responsibility was for selecting third-party hardware and software integrators and managing customer/vendor interaction. As part of this role, he was responsible for installation and support of gateways for legacy systems to interface with the CDPD network. The list of vendors included IBM, Motorola, AT&T, Novell, Microsoft, Lotus, SCO, PCSI, Sierra America, Cisco Systems and Bay Networks (Wellfleet). He was involved in the design, implementation, maintenance and troubleshooting of Local Area Networks and PCs. He also prepared existing networks for continuing maintenance contracts, including thorough documentation, debugging and stabilizing.

Mike Hazel has 20 years in the data and telecommunications field.

Experience

1994-1997 Bell Atlantic Mobile Systems

Systems Engineer

Integrated customer networks and applications with Bell Atlantic's Cellular Digital Packet Data (CDPD) Network. Functions included project management, WAN/LAN design and integration, application selection and optimization, internal and external support, presentation, and training on CDPD, LAN, WAN and TCP/IP technologies. Selected third-party hardware and software integrators and managed customer/vendor interaction. Installed and supported Gateways for legacy systems to interface with the CDPD network. The majority of CDPD hardware and software platforms implemented were first release or still in beta development. Vendors included IBM, Motorola, AT&T, Novell, Microsoft, Lotus, SCO, PCSI, Sierra Wireless, Cincinnati Microwave, Software Corporation of America, Cisco Systems and Bay (Wellfleet). Supported several customers through the process of designing and integrating IP based, routed networks into their legacy systems, including SNA, IPX, X.25 and NetBIOS/NetBEUI based LANs and WANs

1994 Preferred Computer Care

Network Engineer

Designed, implemented, maintained and troubleshot LANs and PCs. Prepared existing networks for continuing maintenance contracts, including thorough documentation, debugging and optimizing.

1992-1993 Offline Services

Self-Employed Consultant

Provided consulting services for small businesses to help them determine their hardware and software needs. Functions included network design and installation, programming and extensive troubleshooting.

1989-1993 Maricopa County

Operations Lead

Supervised several operators supporting a DPS8(GCOS3), IBM 3090(MVS/XA), VAX6000(VMS) cluster and numerous PCs networked on Netware 3.11. Users environments included VT100-220, OS/2 PCs and IBM3270 terminals. Maintained external transport including Fiber, T1, DDs and 3002 circuits. Provisioned TCP/IP, IPX/SPX, SDLC, LAPB and DEC Ethernet protocols. Also trained on Netview, VTAM, CICS and DCL.

1988-1989 Maricopa County

Communications Technician

Installed, maintained and repaired all aspects of network communication systems. Bench tested hardware such as modems, MUXs and terminal controllers. Configured terminal, communications and FNP equipment. Supported Synchronous, Asynchronous and BiSynchronous transports.

1983-1988 Maricopa County

Mainframe Operations

Operated H6680(GCOS3), DPS8(GC0S3) and DPS6(GC0S6) mainframe computers primarily in a batch environment with emphasis on communications and training of new operators. Performed periodic system saves, restores and recoveries.

1979-1981 U.S. Air Force

HQ Mainframe Operator

Operated two H6060 mainframe systems with emphasis on WWMCCS. Ensured timely throughput of nightly production runs, performance of nightly saves as well as periodic systems saves, restores and recoveries. Maintained, saved and established mainframe configurations.

Education / Certifications

- Gateway College – VTAM Operations, REXX Programming, CICS Overview Operation, TXO/ISPF, MVS JCL, VAX DCL
- Phoenix College – COBOL programming
- USAF Technical Training – H6000 Mainframe Operations, PDP-11 and WW Operations
- AST Server Support
- Microsoft Product Specialist (13822)
- Novell CNE (#6217342), Novell CNA v3.11

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CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing Direct Testimony of Michael Lee Hazel on all parties of record in these proceedings by mailing a copy thereof, properly addressed with first class postage prepaid to the following:

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Dated at Washington, D.C., this 25th day of April, 2003.

Michelle D. Diedrick

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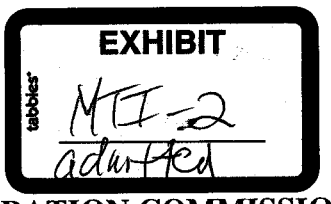

BEFORE THE ARIZONA CORPORATION COMMISSION

MARC SPITZER
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IN THE MATTER OF INVESTIGATION INTO QWEST CORPORATION'S COMPLIANCE WITH CERTAIN WHOLESALE PRICING REQUIREMENTS FOR UNBUNDLED NETWORK ELEMENTS AND RESALE DISCOUNTS	)	DOCKET NO T-00000A-00-0194 PHASE II

NOTICE OF FILING OF REBUTTAL TESTIMONY

Mountain Telecommunications, Inc. ("MTI"), hereby files the Rebuttal Testimony of Michael Lee Hazel in the above-captioned matter.

Respectfully submitted,

Mitchell F. Brecher
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800 Connecticut Avenue, NW
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May 12, 2003

BEFORE THE ARIZONA CORPORATION COMMISSION

MARC SPITZER
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IN THE MATTER OF INVESTIGATION INTO QWEST CORPORATION'S COMPLIANCE WITH CERTAIN WHOLESALE PRICING REQUIREMENTS FOR UNBUNDLED NETWORK ELEMENTS AND RESALE DISCOUNTS	DOCKET NO T-00000A-00-0194 PHASE II

REBUTTAL TESTIMONY OF MICHAEL LEE HAZEL

Q.1 Please state your name, position, and business address?

A.1 My name is Michael Lee Hazel. I am Vice President, Network, Mountain Telecommunications, Inc. My business address is 1430 W. Broadway, Suite A-200, Tempe, Arizona 85282.

Q.2 Have you testified previously in this proceeding?

A.2 Yes. I submitted direct testimony in this proceeding on April 28, 2003.

Q.3 Based on the testimony filed, do you still believe that Staff Option 1 is the most appropriate solution to the Transport pricing problem identified by Staff and MTI?

A.3 Yes. Staff Option 1 would reinstate the rates which were in effect prior to issuance of the Phase II Order, pending completion of Phase III. As Staff witness William Dunkel testified, the rates which were in effect prior to the Phase II Order "had been previously approved by the Commission." (Dunkel Direct Testimony at p. 3 lines 17-18). Thus, there can be no doubt that those Commission-approved rates are lawful rates and that reinstatement of those lawful rates is a fair, equitable and appropriate solution to the problem occasioned by Qwest's development of Transport rates which, in all circumstances, included entrance facility charges, pending completion of Phase III.

Q.4 What are your views on Qwest's stated preference for Staff Option 2?

A.4 I disagree with the analysis and conclusion presented by Staff witness Teresa K. Million. Her objection to Staff Option 1 seems to be based on a concern that it would somehow be inconsistent to use HAI model-derived rates for loops, but not for Transport. I realize that the Commission expressed a preference for use of the HAI model to derive loop and Transport rates in the Phase II Order. However, it should be noted that, at the time of the Phase II Order, the Commission did not know and did not have any reason to know that Qwest would apply the HAI model to develop Transport rates in a manner which would result in entrance facility rates being charged for Transport facilities that do not utilize entrance facilities. Whatever inconsistency results from Staff Option 1 pales in comparison to basing rates which include rate elements for services and facilities not utilized by customers. Staff Option 2 would not address this facial inequity. As I understand Qwest's testimony with regard to how Staff Option 2 would be

implemented, Qwest would take the ratio of entrance facility and direct trunk transport costs and apply that ratio to the total transport costs produced by HAI (Million Direct Testimony, p. 2 line 16 – p. 3 line 7). Application of that formula would result in companies like MTI being charged Transport rates which include some portion of entrance facility costs even if they use little or no entrance facilities. In the words of Staff witness Dunkel, this would result in companies like MTI "paying for entrance facilities which they are not using." Mr. Dunkel quite correctly described that situation as an "overcharge." (Dunkel Direct Testimony at p. 5 lines 14-15).

Q.5 Could MTI accept Staff Option 2 on an interim basis?

A.5 Yes. For the reasons explained in my Direct Testimony, I believe that Staff Option 2 is unnecessarily complicated. Given the fact that it took Qwest not less than six months to implement the Phase II Order, it is important that the Commission adopt a remedy to the Transport rate situation that is the subject of this expedited hearing which can be promptly implemented. I disagree with Qwest's analysis as articulated in Ms. Million's testimony as to why Staff Option 2 is preferable. However, if the Commission concludes that Staff Option 2 is the preferable approach notwithstanding MTI's and Staff's testimony on the subject, MTI could accept that decision, provided that it is an interim arrangement only, and that it not compromise nor impede a thorough examination of Transport pricing and pricing for other unbundled network elements in Phase III.

Q.6 Could you expand on your views with regard to Phase III pricing issues?

A.6 I realize that the Phase III issues are beyond the scope of this expedited proceeding. However, in reviewing the documentation attached to Ms. Million's testimony, I observed some disturbing factors. For example, it appears that Qwest has improperly calculated prices for DS3 facilities. Qwest calculates the DS3 Transport rate (without entrance facilities) to be $983.90.

That is far above Qwest's DS3 rate of $353.05 which was the applicable rate prior to the Phase II Order. Based upon my review of the attachment to Ms. Million's testimony, it seems that Qwest has established a DS3 rate by taking the DS1 rate and multiplying it by 28 – the number of DS1 circuits in a DS3 facility. Anyone familiar with telecommunications facilities pricing knows that the costs of providing a DS3 facility are not 28 times the costs of providing a DS1 facility. This and other pricing issues should be thoroughly addressed in Phase III.

Q.7 Are there other pricing irregularities which warrant Commission action?

A.7 Yes. As I discussed in my Direct Testimony (at p. 6 line 7 – p. 7 line 6), Qwest has increased its multiplexing rates by fourteen percent despite the fact that the Commission, in the Phase II Order, expressly declined to set new prices for multiplexing on the basis that there was not sufficient evidence to render a decision. Staff Option 1 would rectify this situation by reinstating the rates in effect prior to the Phase II Order for such unbundled network elements as multiplexing for which the Commission declined to establish new rates.

Q.8 Based on the initial testimony, do you still believe that the rates determined in this proceeding should be effective retroactive to June 12, 2002?

A.8 Yes. I understand that Qwest objects to application of the rates established in this proceeding effective June 12. However, it has offered no serious legal or policy reason why the rate changes ordered in this proceeding should not be effective June 12, 2002. I do not believe that either Staff Option 1 or Staff Option 2 would constitute retroactive ratemaking. As Staff witness Dunkel notes in his testimony, the rates in effect prior to Phase II (Staff Option 1) "had previously been approved by the Commission." (Dunkel Direct Testimony at p. 3 lines 17-18). I am not an attorney but I do not understand how reinstatement of rates which already have been approved and determined by the Commission to be lawful rates could possibly be "retroactive

ratemaking." In addition, I understand that Staff's Response to the Motions of MTI, Qwest and Time Warner recommends that the Commission reopen the record of Phase II pursuant to Arizona Revised Statutes § 40-252. That section empowers the Commission, upon notice and an opportunity to be heard, to rescind, alter, or modify any order or decision made by the Commission. It further provides that such rescission, alteration or amendment should be effective as an original order or decision. When a decision, such as the Phase II Order, is about rates, it follows that rescission, alteration or amendment of that decision will involve rescinding, altering or amending the rates ordered by that decision. There would have been no reason for the legislature to authorize the Commission to make such rescissions, alterations or amendments in rate case orders unless that authority included the power to rescind, alter or amend the rates established in those orders. As acknowledged by the Staff Response and by Staff witness Dunkel's testimony, this expedited proceeding is about correcting a mistake. As Mr. Dunkel testified, "[t]he cost studies and the rates assumed that there was one entrance facility for each transport rate. Therefore, the transport rates that were approved effectively included the cost of one entrance facility." (Dunkel testimony, p. 4 lines 10-12). It is undisputed that the assumption was incorrect. It was incorrect on June 12, 2002; it is incorrect today; it will be incorrect on the day the Commission issues an order following this expedited hearing. Given that this proceeding is about correcting a mistake or a misunderstanding, the only appropriate remedial action is to have the correction revert back to when it was initially made. If the rate changes ordered in this proceeding are, as advocated by Qwest, changed prospectively only, then the result will be that companies like MTI and others will, as stated by Staff witness Dunkel, be "effectively paying for entrance facilities that they are not using" for the entire period between June 12, 2002 and the day that the Commission issues an order following this expedited proceeding. Mr. Dunkel

correctly describes this situation as an "overcharge" to those companies. (Dunkel Direct Testimony at p. 5 lines 14-15). There is another reason why the rate adjustments made in this expedited proceeding should be effective June 12, 2002 – the effective date of the Phase II Order. Because it took Qwest not less than 6 months to implement the rate changes required by the Phase II Order, the substantial Transport rate increases resulting from Qwest's improper inclusion of entrance facility charges in all Transport rates was not discovered or even discoverable until early 2003 when MTI and other customers began receiving invoices (including retroactive charges back to June 12, 2002) based on those rates. As I explained in my direct testimony, I attempted to contact Qwest to inquire how it planned to establish Transport rates, and never received a direct response (Direct Testimony at p. 5 lines 9-13). To now allow Qwest to enjoy the unwarranted economic benefits of overcharging customers for Transport for the period between June 12, 2002 and the effective date of an order issued in this expedited proceeding (a period that will almost certainly exceed one year) would result in Qwest reaping the benefit from its own dilatoriness in implementing the Phase II Order. I realize that issues surrounding Qwest's implementation of the Phase II Order are before the Commission in Docket No. T-01051B-02-0871. While it is not my purpose to testify as to what sanctions, if any, should be imposed against Qwest based on its delayed implementation of the Phase II Order, I do not believe that Qwest's delay in implementation should enable it to earn an unjustified windfall by receiving excessive rates for the period between June 12, 2002 and whenever the Commission acts in this proceeding. That is another reason why the Transport rate adjustments should be made effective June 12, 2002 – the effective date of the Phase II Order.

Q.9? Do you agree with Qwest's position that adjusting the Transport rates effective June 12, 2002 would violate interconnection agreements?

A.9 No. I have reviewed Ms. Million's testimony on that point and I disagree with her conclusion. I do not profess to be familiar with every Commission-approved interconnection agreement but I familiar with the agreement between MTI and Qwest as I have been MTI's main negotiator on interconnection with Qwest. There are provisions in the MTI-Qwest agreement (approved by the Commission) that state that the agreement is based on existing law and that if there are changes in the law, the agreement is to be amended to reflect those changes. In my opinion, changing the rates charged pursuant to an interconnection agreement to conform with current Commission pricing orders is fully consistent with the agreement. Indeed, the rates that are actually contained in the MTI-Qwest interconnection agreement are not those established by Qwest based on its implementation of the Phase II Order since our agreement was executed and approved long before the Phase II Order. Just as Qwest was able to change the rates based on its initial implementation of the Phase II Order notwithstanding the agreement, so too will it be able to change the rates to conform with any corrective decision issued in this proceeding.

Q. 10 Does this complete your testimony?

A. 10 Yes it does.

CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing Rebuttal Testimony of Michael Lee Hazel on all parties of record in these proceedings by mailing a copy thereof, properly addressed with first class postage prepaid to the following:

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Dated at Washington, D.C., this 12th day of May, 2003.

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